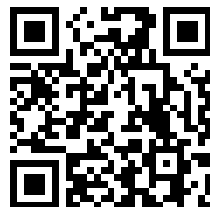
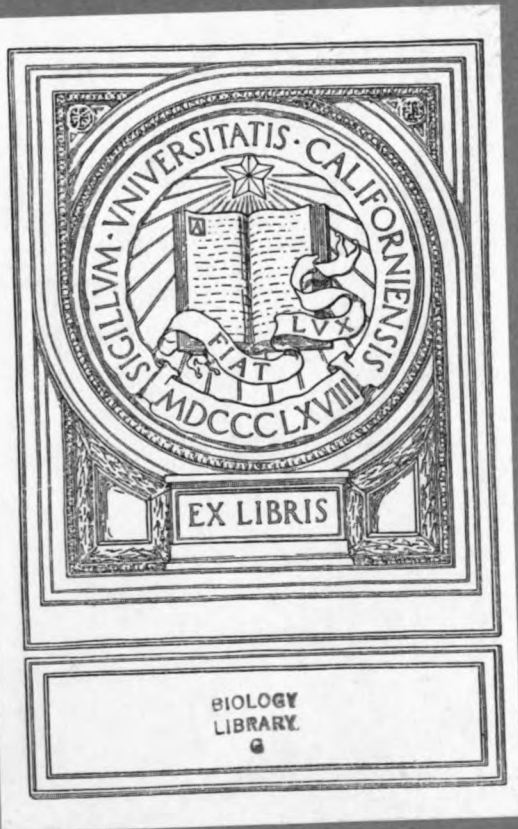

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OF THE

Royal Army Medical Corps

EDITED BY

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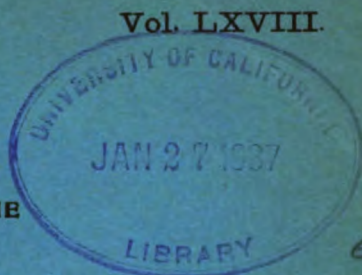
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Original Communications.

TYPHOID FEVER.

**An Examination of the Virulence of Strains of *Bacterium Typhosum* derived
from Blood Cultures of One Hundred Consecutive Cases.**

By **MAJOR H. J. BENSTED, M.C.,**

Royal Army Medical Corps.

Introduction.

IN a previous series of communications (Perry, Findlay and Bensted, 1933 and 1934), investigations were described with regard to the virulence of *Bacterium typhosum* as assessed by the result of intraperitoneal injections of measured doses of the organisms into white mice. It was stated in the last of these papers (1934(b)) that "in endemic areas of typhoid fever it should be possible to ascertain the correlation, if any, between the virulence of the organism isolated and the clinical type of case." It was also considered probable that bacilli recovered from fatal cases would have a higher virulence than those derived from the milder type of case.

With a view to answering these statements arrangements were made for the collection of *Bact. typhosum*, isolated from the blood, from one hundred consecutive cases of typhoid fever.

Blood-culture is a routine practised in India on almost every undiagnosed fever of more than three days' duration. Provided that veni-puncture is undertaken with due care at the correct time during the illness and the blood introduced into fresh ox-bile, little difficulty is experienced in cultivating the infecting organism in cases of the enteric group of fevers. When the very large numbers of blood-cultures undertaken in military

hospitals and the relatively small numbers of isolations of enteric organisms are considered, it may be thought the technique or the medium is at fault. Whilst this may be true on occasions, it is believed, by those with very considerable and intimate experience of this sort of work, that the positive isolations represent at least 90 per cent of the cases of the enteric group amongst the very large number of continuous fevers investigated.

The incidence, at the present time, of typhoid fever amongst the military population of India is not great, and in the actual area in which this investigation has been undertaken, although perhaps the most important military district in the country, the numbers of cases seen in the hospitals were few. In view of this cultures were, of necessity, obtained from cases occurring in various stations throughout India and, except for one small group of three cases, no strain could be regarded as forming part of an epidemic.

In order to avoid the possibility of antigenic changes taking place through frequent subculture on artificial media, medical officers were asked to forward the strains as soon after their isolation as possible. A simple proforma was also supplied to enable the essential facts of each case to be recorded. Owing to the difficulties that always arise when an investigation of this nature is undertaken it was not possible to obtain all the information or material on some occasions. Generally, however, the data and the specimens forwarded were sufficient to enable the main part of the work to be completed.

When investigating the virulence of an organism by injecting broth suspensions into animals it is essential that the medium should promote as luxuriant and regular growth of the bacterium as possible. With few exceptions laboratories in India employ "Lab.-Lemco," together with a proprietary brand of peptone, for the preparation of their basic media. Whilst the manufacture of a culture medium from such ingredients is simple and generally free from objections of a religious nature, the growth of bacteria seeded into it is not always satisfactory. Again, some of the brands of peptone supplied impart such a dark colour to the broth that the estimation of bacterial growth by matching against a standard opacity tube is often a matter of extreme difficulty.

It was found, however, that the staff of the laboratory raised no objection to working with the heart muscle or the pancreas of the ox. An extract of ox pancreas was, therefore, prepared, and by allowing this to act upon a mince of the heart muscle a digest medium was obtained that now forms the basis of all the routine culture media used in the laboratory. The growth of *Bact. typhosum* in this digest broth has been very satisfactory and regular and the pale colour of the broth has enabled the matching with the opacity tubes to be carried out readily.

The technique of the virulence tests followed closely that described originally by Perry, Findlay and Bensted (1933 (a)) except that owing to

the large number of strains to be examined it was often not possible to employ more than five mice for each test dose. Practically all the animals used in the investigation had to be bred in the laboratory and it was, in consequence, sometimes difficult to find a sufficient number of males of 20 grammes in weight for any one experiment. Mice of from 15 grammes upwards, therefore were employed. The results, on the whole, were very regular but, owing to an occasional discrepancy, it was decided to record virulence in terms of the Average Lethal Dose (A.L.D.) rather than the Minimal Lethal Dose (M.L.D.).

In the previous work, published in conjunction with Perry and Findlay, never less than ten mice were injected with the same test dose and, as the experiment was repeated at least twice, the M.L.D. thus expressed represented a test performed upon a minimum of thirty selected animals. It was felt, therefore, that under the condition obtaining in the present investigation the A.L.D. might more truly represent the estimated virulence of the organism than the standard previously employed.

Preliminary Classification of the Strains.

Each culture was examined as soon as it was received in the laboratory. It was first plated on deep agar plates, and after eighteen hours' incubation the various media were inoculated from a single selected colony, so that all the tests concerned with the confirmation of the identity of the organism and the correlation of its virulence by the mouse test with its agglutination in the living state with a pure "O" serum could be carried out with bacteria that had the closest possible connexion.

In order to maintain the same standards that obtained in the original mouse experiments, tests were from time to time carried out in parallel with certain classical strains whose virulence had been confirmed by several independent workers (Perry, Findlay and Bensted, 1933; Felix and Pitt, 1934; Kauffmann, 1935). It was found that of the typical strains isolated from the primary blood-cultures, only sixteen were insensitive to "O" agglutination in the living state or approached the virulence of Ty. 2, Watson, or Rejuvenated Rawlings (called Rawlings-Ben. by Kauffmann), and that the remaining eighty-four possessed a virulence that was definitely less than these standard strains.

Ty. 2 and Rawlings-Ben. were subcultured on to egg-medium in McCartney's bottles in February, 1935, and apart from a subculture taken from each in March, 1935, the bottles were not opened until July, 1936. After one subcultivation grown on agar for eighteen hours at 37° C., both these strains were found to be completely insensitive to "O" agglutination in the living state and their average lethal dose was 50 million. It has been realized for some time that Ty. 2 would retain its virulent properties over considerable periods on ordinary media without any special precautions (Felix and Pitt, 1934), but there is little doubt that when first rejuvenated Rawlings showed a tendency to revert if very frequently

subcultured on agar, as noted by Brown (1936). Egg-medium was recommended to the present writer in 1932 by Dr. W. M. Scott for the preservation of the smooth characters of the typhoid bacillus, but it was immediately evident that the medium also preserved the virulent characters of the organism, and since that date Rawlings-Ben has been maintained thus in sealed bottles. It appears that this strain now consists of pure V (Kauffmann) forms and shows as little tendency to revert as Ty. 2.

In Table I the virulence tests of the typhoid bacilli isolated from a hundred consecutive primary blood-cultures are summarized.

TABLE I.

Number of strains examined	Average lethal dose in millions	Agglutination of live cultures with a pure "O" serum
16	50	Nil
6	50-80	±
59	80-100	+
19	Above 100	++ to ++++

It will be seen that the resistance of living cultures of typhoid bacilli to "O" agglutination is regularly and directly proportional to their virulence as was noted by Felix and Pitt (1934) and others. In carrying out these tests it was observed frequently that the sensitivity of the organism to "O" agglutination was a more accurate guide in observing slight differences in virulence than the actual mouse test itself unless large numbers of animals were employed.

TABLE II.

Clinical type of case	Number of strains examined	Agglutination of live culture with "O" serum	Average lethal dose in millions
Not severe	1	Nil	50
	6	+++	100-200
	2	+++++	Over 200
Severe	6	Nil	50
	3	±	50-80
	55	+	80-100
	7	+++	100-200
Very severe	7	Nil	50
	3	+++	100-200
Fatal	2	Nil	50
	3	±	50-80
	4	+	80-100
	1	++	Over 100

Table II shows the classification of the primary blood-cultures according to the clinical severity of the case originating them.

It will be evident at once that although the very severe and fatal cases

did not always yield at the original blood-culture, organisms of the highest virulence, the bacteria recovered from over 50 per cent of all the cases which were of moderate severity, were also of moderate virulence.

Mild Cases.

The objections to classifying cases of an acute infectious disease according to their clinical severity are obvious, especially when the observers are many and widely separated. Nevertheless it was felt that after analysing the records, nine cases, with their short pyrexial periods and absence of serious symptoms or complications, might reasonably be labelled mild. Table III gives a brief summary of these cases, which, with the exception of B99, yielded organisms of less than average virulence.

TABLE III.

Index number	Interval since last TAB	Agglutinins at time of culture	Agglutination of live culture by "O" serum	A.L.D. in millions
B15	Uninoculated	H.Nil.0.125	++++	Over 200
B37	12 months	H.275.0.25	+++	100-200
B53	10 months	H.500.0.25	+++	100-200
B55	6 months	H.250.0.125	+++	100-200
B60	6 months	H.250.0.110	+++	100-200
B67	12 months	H.125.0.Nil	+++	100-200
B78	4 months	H.1000.0.275	+++	100-200
B79	2 months	H.300.0.25	++++	Over 200
B99	9 months	H.450.0.70	Nil	50

Note.—Cases B15 and B79 were extremely mild and their pyrexia only lasted for six days in each case. Case B99 was a mild fever that was not considered typhoid until the routine blood-culture, taken on the fifth day, resulted in the isolation of *Bact. typhosum*. The pulse was slow and the patient displayed no other prominent sign or symptom than an impaired mentality. The temperature had fallen to normal on the ninth day and convalescence was rapid. Blood-culture on the seventh day was sterile, but one or two of the faecal cultures during convalescence yielded organisms of undiminished virulence. The agglutination titres for the typhoid bacillus on the various days of the disease are given below:—

		5th Day	11th Day	14th Day	19th Day
H.	..	450	500	175	175
O.	..	70	175	125	125
Vi.	..	Not done	70	75	50

Very Severe and Fatal Cases.

With regard to the very severe and fatal cases, it was also felt that they were sufficiently different from the average illness due to typhoid fever to warrant examination of their histories in some detail.

Three of the ten very severe cases occurred in young uninoculated children, who had prolonged pyrexias with delirium and other serious

symptoms. They relapsed, but finally all three, B31, B33, and B34, made good recoveries.

Of the remaining seven cases in this group, each patient had received prophylactic inoculations, and the organisms cultivated from the blood were of the highest virulence :—

B39 had been inoculated twelve months previously. The case showed marked toxicity with delirium with a continuous pyrexia of thirty-five days. At the end of fifteen days the "TO" agglutinins had only risen to 50. There was no relapse, but recovery was very slow.

B45 had been inoculated fourteen months previously. The disease ran a normal course for the first part, but relapsed on the twenty-sixth day. Myocardial degeneration set in and the outlook became very serious when serum from a patient convalescent from severe typhoid was injected intramuscularly. Recovery was dramatic. The "O" agglutinins which had risen to 100, fell to zero at the time of the relapse before they began to rise again.

B47, a case related to B45, had been inoculated less than three months previously. He relapsed about the twentieth day and was clinically similar to B45. This case was also treated with convalescent serum and the recovery was uneventful. As in the previous case the "TO" agglutinins, which had a titre of 35 at the beginning of the illness, sank to zero before the relapse, and five days after the administration of the convalescent serum had risen to 100.

B57 had been inoculated seven months previously. The case was complicated by a serious bronchopneumonia. The "O" agglutinins rose to 500 by the fifteenth day.

B81 had been inoculated three months previously. Bronchopneumonia was so early that typhoid fever was not considered until the organism was isolated from the first blood-culture on the tenth day. The "O" agglutinins only rose to 125. The case became a temporary urinary carrier.

B87 had been inoculated one month previously. The case was very toxic with hæmorrhages and prolonged pyrexia. Only one sample of blood-serum, taken on the fifth day, was available when the "TO" agglutinins were found to have a titre of 200.

B96 had been inoculated ten months previously. Very toxic with delirium and long pyrexial period. No relapse and no record of "O" agglutination available.

In the series of eleven fatal cases investigated there were only two in which the original blood-culture yielded an organism of the highest virulence :—

B46. A companion case to B45 (*v.s.*), had been inoculated fourteen months previously. After a preliminary fever of normal intensity a relapse occurred about the twenty-fifth day with marked toxæmia, delirium and myocardial involvement. The patient died before the treatment, which

appeared to be so effective in the case of B45, could be exhibited. The "TO" agglutinins remained at 35 throughout the illness.

- B100. An uninoculated case in a boy aged 12. A very severe case originally diagnosed bronchopneumonia, but a blood-culture taken on the fifteenth day gave pure growths of *Bact. typhosum*. The case steadily improved up to the thirtieth day, when a relapse occurred with marked myocardial involvement. A fatal issue followed with great rapidity.

The essential details of the other nine fatal cases are as follows :—

B88 { These two cases had been inoculated some eleven months previously. They were very severe and toxic from the beginning, yet the bacilli isolated from the primary blood-culture were only just above average virulence. Both cases succumbed to peritoneal involvement. In B88 the perforation was successfully treated by surgical means, but the patient did not long survive.

B93 had been inoculated ten months previously and yielded an organism rather above the average virulence. The patient, although his "TO" agglutinins rose to 225 on the eleventh day, showed no clinical resistance to his illness and died on the thirteenth day.

B89 { These cases had all been inoculated well within the year and at no time during their illnesses were organisms of more than average virulence isolated from their blood. Clinically the cases presented the same picture as B93, quoted above, and a fatal issue followed without any apparent fight on the part of the patients.

B98. Inoculated two and a half years previously, and the organism recovered from the primary blood-culture was just above average virulence. From a clinical point of view the case appeared to be proceeding normally when suddenly on the twenty-seventh day the patient became gravely ill with acute toxæmia and delirium to which he quickly succumbed.

B92 had been inoculated sixteen months previously. The clinical history of this case is again very similar to that of B93, but the culture obtained from the blood was extremely sensitive to "O" agglutination, and the A.L.D. was estimated as well over 100 millions.

TABLE IV.

Index number	Age period	Day of culture	Agglutination of live culture by "O" serum	A.L.D. in millions	Remarks
B10	Adult	6th	+++	Over 100	Severe. No complications. Recovery
B15	Adult	5th	++++	About 200	Very mild. Recovery
B31	Child	6th	+++	Over 100	Very severe. Relapse. Myocarditis. Recovery
B33	Child	5th	+++	Over 100	Very severe. No complications. Recovery
B34	Child	8th	++	About 100	Very severe. Relapse. Recovery
B54	Adult	8th	+	80-100	Not severe. No complications. Recovery. Paratyphoid previously
B100	Child	15th	Nil	50	Very severe. Relapse. Myocarditis. Fatal

Uninoculated Cases.

Although few individuals are admitted to military hospitals in India who have not received prophylactic inoculation against the enteric fevers, there are certain classes who may not be protected. Amongst these are still to be found children of both officers and subordinates, together with certain followers. In the present series seven such cases occurred, and these have been summarized in Table IV, which needs no comment.

Change in the Virulence of a Particular Strain.

Experiments were described by Perry, Findlay and Bensted (1933), in which it was shown that if a sub-minimal lethal dose of typhoid bacilli of high virulence were injected intraperitoneally into mice, organisms could be recovered, after varying intervals, from such animals that had a lower virulence than the bacteria originally introduced. Conversely, it was also shown that if exactly lethal doses of bacilli of relatively low virulence were similarly injected into mice it was possible to recover, post-mortem, from the animals organisms having an exalted virulence.

TABLE V.

Index number	Day of disease	Agglutination of live culture by pure "O" serum	A. I. D. in millions	Remarks
B26	4th	+	50-100	Severe case at the beginning. Crisis and rapid recovery
	5th	+	50-100	
	7th	++	50-100	
	9th	Culture sterile	—	
B45	7th	Nil	50	Very severe case. Relapse 26th day. Convalescent serum injected. Recovery
	9th	Nil	50	
	12th	+	50-100	
	13th	Culture sterile	—	
B46	7th	Nil	50	Very severe case. Relapse 28th day. Delirium and myocarditis. Death
	9th	+	50-100	
	10th	Culture sterile	—	
	29th	Nil	50	
B47	24th	Nil	50	Very severe case. Relapse 23rd day. Very toxic and delirious. Convalescent serum. Recovery
	25th	±	50-80	
	27th	++	About 100	
	29th	Culture sterile	—	
B53	8th	+	50-100	Severe case, but recovery without complications
	9th	+	50-100	
	13th	++	Above 100	
	15th	Culture sterile	—	
B56	6th	+	50-100	Severe case, but recovery without complications
	8th	+	50-100	
	10th	+++	Above 100	
B98	12th	±	50-80	Severe case that appeared to be recovering slowly. Temperature not quite normal. Patient suddenly became gravely ill (27th day) and died three days later
	14th	+	50-100	
	17th	+	50-100	
	23rd	++	Above 100	
	26th	++	Above 100	
	28th	Nil	50	

It was considered that an examination of the cultures recovered from the blood at different periods during an attack of typhoid fever from the same patient might exhibit certain changes in virulence that might be comparable to these experimental observations. Table V gives a brief account of multiple blood-cultures carried out in seven cases.

In the case of B26 the mouse test was not sufficiently delicate to demonstrate the decrease in virulence of the third blood-culture. The increased agglutinability, however, of the living culture in the presence of a pure "O" serum was very marked when suspensions of the three organisms were examined together.

The cultures from B46 and B98 demonstrated both changes. In the former case the organism lost virulence during the first part of the disease and after the relapse this was enhanced. In the case of B98 there was a slight though steady loss of virulence until a day or two before death when the sixth and last blood-culture was completely insensitive to "O" agglutination and by the mouse test was found to have an A.L.D. of 50 millions.

Further examples of this exaltation of virulence have been observed in two of the fatal cases mentioned above:—

B88. Three blood-cultures during life were slightly sensitive to "O" agglutination and had an A.L.D. of 80 millions. The organism recovered, post-mortem, from the spleen was insensitive to "O" agglutination and had an A.L.D. of 50 millions.

B91. The only blood-culture during life was readily agglutinable when the living strain was examined with an "O" serum and its A.L.D. was 100 millions. The spleen culture was completely insensitive and the A.L.D. was 50 millions.

It should be noted, however, that this increase in virulence of spleen cultures is by no means a regular finding. In four of the other fatal cases, B89, B90, B92, and B95, from which organisms of average or less than average virulence had been recovered during life, the post-mortem spleen cultures showed no exaltation of virulence. As has already been mentioned these four cases had a fatal termination without any obvious clinical reaction on the part of the patient.

When the attempts to raise the virulence of the classical avirulent Rawlings strain were first carried out (Perry, Findlay and Bensted, 1933) it was observed that massive doses of the strain, injected intraperitoneally into mice, caused the death of the animals without inducing any enhancement of the virulence of the organism that might be recovered at the post-mortem examination. If, however, the dose of organisms was just lethal, it was found that this change might be brought about. A parallel to this would appear to exist in some natural infections in man. When the infecting dose is too massive or the agents of resistance (whatever they may be) too weak, a fatal issue may occur from an infection with an

organism of relatively low virulence and without any enhancement taking place during the illness. Cases B89, B90, B92, B93, B94 and B95 would appear to be examples of this. Where there is some marked reaction produced in the body of the patient the virulence of the infecting organism may become exalted. It is possible that the reactions produced by the relapses of B46 and B98 and the peritoneal involvement of B88 and B91 were responsible for the increase in virulence of the bacilli finally isolated from these cases.

It appears probable, therefore, that the behaviour of the typhoid bacillus in natural infections in man are subject to the same influences that have been observed in the experimentally induced infections in mice.

Vi-Antigen in the Cultures Isolated.

By the use of a pure Vi-antiserum it was possible to show the presence of Vi-antibody in all the strains isolated from the blood-cultures. Felix, Bhatnagar and Pitt (1934) have shown that the agglutinability of a living culture in the presence of a pure Vi-antiserum is inversely proportional to its Vi content and Felix and Pitt (1936) demonstrated that the Vi absorptive power of a living culture was directly proportional to its virulence. No attempt was made to estimate the proportion of Vi-antigen present as a routine in the series under investigation, but certain of the cultures were examined by this method and Table VI shows the results of absorbing a pure Vi-serum with constant doses of living cultures of strains compared with their virulence.

TABLE VI.

Culture	A.L.D. in millions	Agglutination of living culture by a pure "O" serum	Agglutination of living culture by a pure Vi-serum	Absorptive power of living culture of constant dose against a pure Vi-serum (titre 1:500)
901 "O"	Over 200	++++	Nil	ViS.—901 "O" v. B92 = 500
B15	About 200	++++	++	ViS.—B15 v. B92 = 200
B92	About 100	++	++	ViS.—B92 v. B92 = 100
B90	50-80	±	+	ViS.—B90 v. B92 = ?25
B45	50	Nil	+	ViS.—B45 v. B92 = Nil
Rawlings	50	Nil	+	ViS.—RB v. B92 = Nil
Ben				

Note.—The equation in the above table shows the result of absorbing a pure Vi-serum with a constant dose of a living culture of the particular strain shown in column 1 and then testing it against a living strain that was known to agglutinate well with the Vi-serum. The final figure is the titre of Vi-agglutinins remaining.

Estimation of Vi-antibodies in the Serum of Patients.

Although the presence of Vi-antibodies was demonstrated in the serum from a considerable number of cases the actual estimation of the titre was

a matter of some technical difficulty owing to the different absorbing dose required for different sera and the possible loss of Vi-antibody in the process of absorption. The preliminary treatment of the absorbing bacteria with acid as recently recorded by Felix and Pitt (1936) has been tried in a few cases but there has not been sufficient opportunity of examining this method for the demonstration, if any, of the correlation between the virulence of the organism responsible for the infection and the production of Vi-antibody in the blood of the patient.

The Virulence of Organisms Isolated from Carriers.

It is perhaps outside the main scope of this communication, but it may be of interest to note that out of five carrier conditions investigated all were found to be excreting organisms of the highest virulence. Three were faecal and two were urinary carriers. One faecal and one urinary carrier were still passing these highly virulent bacteria six months after the acute disease, one urinary and one faecal carrier were of a temporary nature, and one "healthy" carrier was discovered during the routine examination of the stools of a menial prior to his employment in the handling of foodstuffs, but it was not possible to obtain any satisfactory information from him with regard to his previous illnesses. This last case was examined on many occasions over a period of six weeks and bacilli having exactly the same characters were present in the stools in practically every specimen submitted.

In the case of the two temporary carriers it was possible to study the virulence of the organisms recovered from the blood, urine and faeces throughout the disease to convalescence. The A.L.D. remained constant at fifty millions.

Discussion.

It will be evident at once that the questions concerning the correlation of clinical severity with the virulence of the infecting organisms have not been answered very satisfactorily. Whilst the greater proportion of normal cases of typhoid fever appear to have been caused by organisms having an average virulence, there are so many instances where the virulence of the infecting bacilli appears to bear little or no relation to the clinical severity of the case that the estimation of this property of an infecting organism would not seem to have great practical value as an aid to prognosis. At the same time it should be appreciated that amongst the mild cases there was only one that yielded bacilli of high virulence. The very severe and fatal groups produced four organisms of low virulence, but three cases were in young children who had not received any prophylactic inoculation and the other, a fatal case, cannot be satisfactorily explained. With regard to this and the other fatal cases it would appear that the virulence of the bacteria isolated from the blood was not entirely responsible for the

fatal issue. In cases B88, B89, B90, B93, B94 and B95, where the clinical prognosis was so very grave, almost from the very commencement the infecting organisms were not of very high virulence and the "TO" agglutinins rose from a relatively low titre to over 100 before the tenth day.

The "TO" agglutinins were estimated every five or six days in over 50 per cent of the cases investigated and as all the examinations were carried out with standardized broth cultures of *Bact. typhosum* 901 "O" it was hoped that they might, in conjunction with the virulence test of the infecting organism, be of some value in assessing prognosis. So irregular, however, were the results that it was felt that their inclusion in this communication would serve no useful purpose.

It is generally agreed that the titre of the "TO" agglutinins in the blood-serum is a rough guide to the antibody response of the other known agents of resistance of this nature. But, unless the fatal issues referred to above were governed by the initial infecting dose of organisms, it is difficult to believe that there are not other barriers to infection whose breakdown may be responsible for some of the fatal terminations.

Although the cases are in no way selected the numbers are too small to make any comparison of the mortality rates between the inoculated and uninoculated individuals. Superficially it may appear that there is little difference between the percentage of deaths in the two groups, but apart from the fact that only seven uninoculated cases were investigated in this series, it must be appreciated that the one apparently anomalous result was the case of an individual who had a previous history of paratyphoid fever, and on the eighth day of his typhoid attack his "AO" agglutinins were 250.

Since the examination of the series of cultures under review has been completed a further ten uninoculated cases have been collected. It is of interest to note that five of these cases yielded organisms of the highest virulence and terminated fatally. Of the other five organisms that were recovered from the blood-cultures one was of moderate virulence and the remaining four had average lethal doses of well over 100 million and were very sensitive to "O" agglutination. Although these cases were critically ill they eventually recovered.

In view of the recent reports by Felix (1935) and McSweeney (1935) of clinical trials of a Vi-antiserum, a certain amount of interest attaches itself to the three companion cases that relapsed after about the same interval and displayed marked toxic symptoms with myocardial involvement. The rapid disappearance of these toxic symptoms in two of the cases following the exhibition of convalescent serum having a relatively low "O" antibody content suggests that if this agent was responsible for the improvement in the condition, some other factor must have assisted in the neutralization of the toxins produced by the infection.

The change in virulence of the infecting organism during an attack of

typhoid fever follows so closely the changes observed in the experimentally induced infections in mice as to need little comment. It is, of course, possible that many of the blood-cultures of the middle group had suffered this change and that an earlier blood-culture might have yielded organisms of a higher virulence.

Felix, Bhatnagar and Pitt (1934) observed that one of their strains, Ty. 1, existed in two forms, one sensitive to "O" agglutination and the other insensitive. Several strains of the series under review, when received in the laboratory, were found to be a mixture of V and VW (Kauffmann) forms. These were separated from plate cultivations into the two types and sealed in McCartney's bottles for further study after a suitable interval. Whether pure V forms of all strains can be maintained thus on egg-medium for long periods remains to be seen, but it is probable that the behaviour of the new strains, provided they are in a pure V state, will follow that of Ty. 2 and Rawlings-Ben.

The demonstrations of Vi-antigen in all the freshly isolated cultures confirms the findings of Kauffmann (1936), although the work of Gundel and Abdoosh (1936) suggests that such regular results may not always be obtained.

The high virulence of the organisms that may be excreted by "carriers" is difficult to understand. It is possible that it may be associated with tissue reactions such as are known to occur in the gall-bladder of some "faecal carriers."

Summary.

(1) The results of virulence tests of primary blood-cultures in one hundred consecutive cases of typhoid fever are described. 16 per cent were found to be of the highest virulence and 59 per cent of medium virulence.

(2) Over one half of the cases were of normal clinical severity and yielded organisms of medium virulence. The results from mild, very severe and fatal cases were less well defined.

(3) The change in virulence of the organism during its stay in the blood-stream of a patient follows the same lines as the change observed in the experimental infections in mice.

(4) Vi-antigen was demonstrated in all the strains freshly isolated from the blood.

(5) Five "Carrier" conditions were investigated and were found to be excreting organisms of the highest virulence.

Acknowledgments.

I have to thank the numerous medical officers who kindly forwarded cultures and information regarding the cases that had originated them from stations throughout India.

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ANTI-MALARIA DRAINAGE WORK IN THE NEW CHANGI CANTONMENT.

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THE new Military Cantonment of Changi is situated at the eastern end of Singapore Island and includes the south portion of the Island of Tekong Besar lying some five miles east of Changi, and also the area around Pengeleh Point, a tongue of land still further to the east in the State of Johore.

When I first made the acquaintance of this area it consisted of neglected rubber estates and pineapple plantations on the hills and ridges and in the landward valleys, while on the flat land near the sea there were numerous small market gardens ; also large numbers of ponds, in some of which water plants were grown for the feeding of pigs, in others fish were bred, while others were used for duck breeding. A number of meandering tidal creeks were flanked widely on both sides by mangrove swamps. In the Fairy Point and Barrack Hill areas a start had been made in the construction of the cantonment by the Royal Engineers about 1928, but before very much progress had been made all new construction work was stopped in 1929 or 1930 by order of the Labour Government then in office. At the time this happened the completed buildings in the station consisted of two barrack blocks, four blocks of six married soldiers' quarters, and seven officers' quarters. In addition to this building construction, two tidal swamps had been earth-filled, one of which had been converted into a sports ground and the other into a railway yard and a site for future Royal Engineers' store sheds and workshops. Lastly, two swampy valleys, viz. Marsh and Chinese Valleys, had been drained for antimalaria purposes by combined subsoil and surface drains.

Earth-filling of a swamp is not, properly speaking, an antimalaria measure as it is really reclamation of land from the sea with the object of using the ground for building sites or other purposes as was done in the two cases referred to above ; but in these cases the treated ground was provided with subsoil drains, both hill-foot and parallel, during the process of dumping the soil borrowed from adjacent hill slopes on the site, and so these four systems constituted the first permanent antimalaria works carried out in Changi. This was done, I think, in 1929, and was designed by, and carried out under the direction of, Lieutenant-Colonel Playfair, Royal Engineers, and Major Champney, Royal Army Medical Corps, with the assistance of the Chief Medical Officer of Health, Singapore. It is a pleasure to testify to the fact that these drains, after the lapse of six years, are still functioning perfectly, and this fact, in addition, gives us a very

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good proof of the permanent nature of this type of antimalaria measure. No trouble has been experienced in the working of these four systems, with the exception of Marsh Valley, which had again become swampy at the beginning of 1934, when we found that the contour drains had become blocked by roots in one or two places. In one case the collection of roots which had caused the blockage was about forty feet long. These blockages were removed and an additional length of subsoil drain was put in along the lower end of the valley on the left bank; since then the valley has remained dry.

For the few years following the cessation of work these permanent measures, combined with temporary measures such as oil-spraying, etc., served to protect the small community situated in the north-west corner of Changi very successfully, but about the time I happened to be posted to Changi for duty, construction work was just recommencing and this brought about an extension of the inhabited military area in many directions by Royal Engineer directly employed Asiatic labour; numerous contractors' labour gangs were living in temporary wooden huts dotted over a wide area, and a little later British military units.

As one of the fundamental principles of antimalaria drainage work is to have the area to be treated completely drained before the population to be protected inhabits it, there was no time to be lost before commencing work. As is usually the way in military stations, there was no one left of those who had taken part in the work in 1929, and so we had to teach ourselves how to go about it. Fortunately the League of Nations instituted an advanced course in Malariology in 1934. The first course was held in the Singapore College of Medicine in the spring of 1934, and I was given permission by Military Headquarters at Fort Canning to attend. During this course drainage work was extensively dealt with both in the lecture room and in the field by Dr. J. W. Scharff, now Chief Health Officer, Singapore, and so a great deal of information was obtained in a very short time. Armed with this new knowledge I co-operated with Captain H. G. Brownlow, R.E., Garrison Engineer, Pulau Tekong, and Captain J. Farewell, D.C.R.E. Cantonment, Changi, who undertook to carry out this work on the Changi side.

Our first effort was at Sphinx Valley on Pulau Tekong where there was already a large labour force engaged in construction work living in huts on the slope above this valley, in which, as I already knew, the *Anopheles maculatus*, a most dangerous malaria carrier, was breeding.

The valley was extremely swampy with a sluggish stream meandering down the centre. The floor of the valley was covered with short but dense vegetation the roots of which were practically in free water. After Captain Brownlow had had a preliminary survey carried out we had a series of trial bore holes dug along the line of proposed contour drains. These showed us that the level of the water-table was only about six inches from the surface of the ground and that the type of soil that we

had to deal with was a heavy, blue-black, peaty clay, a mixture of red laterite clay and decaying vegetation. With such soil as a surface stratum the water table is bound to be high as the soil has very high water retaining properties. The valley was, therefore, very suitable for subsoil drainage.

Two trenches were then dug along the bottom of the slopes on both sides of the valley to a depth of 5 feet, the bottom of the trenches being



FIG. 1.—India Barracks Swamp. Completing the laying of subsoil pipes.

smoothly graded the whole way at a slope of 1 in 300. A layer of broken brick and metal was put on the floor of the trenches to prevent the subsequent sinking of the pipes in the clay and so altering the line of the fall. The agricultural drain pipes were then laid along the bottom of the trench, their open ends simply being placed together, starting from the lower end of the trench and working up the valley. These agricultural drain pipes are cylindrical pipes of red baked clay (unglazed) and each one is 12 inches in length. When they are placed end to end, there is sufficient room for ground water to enter through this open joint, but it is not intended that water should enter from above as such water would carry silt with it into

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the pipe line and so ultimately block it. To prevent this we used in Sphinx Valley, and all systems subsequently, kneaded clay made into a sausage about 6 or 8 inches long and put over the top and sides of the open joints of the drain pipes. This puddled clay not only serves to prevent water, roots and silt from entering the pipe line from above, but it helps to keep the line of drain pipes straight.

The diameter of the pipes we used was 4 inches for the head of the system and 6 inches for the drain in the lower part of the valley. As explained above, the water that enters the pipe line all comes in from below at the open joints of the pipes, and coming up from below is clean and free of sand. Although the pipes are unglazed and porous to a slight



FIG. 2.—Sphinx Valley Well and Pump House. Showing overflow from well which is fed by a branch of the contour drain.

extent, water cannot and does not enter the sub-soil drain through the sides, but only through the open joints.

To prevent tree roots from creeping down and entering the system I asked for all trees for 25 feet on either side of the line of the subsoil drains to be felled and the ground cleared and this has been our practice since ; actually, Dr. Scharff informs me, it is safer to make this limit 40 feet. After waiting for a week or two to see whether the water in the trenches continued to flow we then had the agricultural pipes put in as described above along the whole length of the system. Some little time previous to our commencing work on this antimalaria system a large well had been sunk for the water supply of the barracks. This well had been dug to a depth of 29 feet, but about the time the subsoil drainage

was being put in, it was not delivering the amount of water required. A little further up the valley on the other bank of the stream we had found that our contour drain had evidently tapped a spring, so we led a line of pipes from the spring under the stream into the sub-soil line down the left bank and then led this line into the well, providing an overflow pipe on the opposite side. By this means the well has since been provided with a most copious supply of perfect water (fig. 2).

At about 150 feet intervals we sank five lengths of tile pipes vertically



FIG. 3.—India Barrack Swamp. Showing subsoil drain with double line of pipes.

from the surface of the ground down to a hole made on the upper surface of the horizontal tile pipe directly underneath. These vertical pipes formed inspection eyes for the purpose of observing the flow of the system after completion of the work and enabled anyone inspecting the system later to detect and locate possible blockages. The upper length of piping in these inspection eyes we sealed over with cement to prevent unauthorized persons from throwing anything into the drain beneath. We then filled in the trenches with the previously excavated soil except when it was very clayey; in this case earth borrowed from the slopes of the valley was used

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and the surface of the ground then levelled as far as possible. We found it a small point, but a point worth observing, to heap the soil excavated in digging the trenches on the stream side of the trench, otherwise heavy rain coming down from the slopes of the valley was liable to wash back the soil into the trench. This is more important where the soil is sandy. In Sphinx Valley the blue clay was terribly difficult to dig and the local Malay inhabitants of Tekong who formed the directly employed Royal Engineer Labour Force here and who, being mostly fisherman were not used to this type of manual labour, had many a sore back and aching shoulder amongst them before they got used to the work.

When the subsoil lines reached the boundary of the War Department property lower down the valley, the level of the valley was nearly sea level, so we brought the subsoil pipe line a little nearer to the surface than 5 feet and finally made both lines open out into open channels of concrete inverts running down an open trench the sides of which were laid back at a slope of 45 degrees. These sloping sides were turfed above and reinforced by square pre-cast concrete slabs which rested below on the edge of the concrete inverts which formed a curved gutter of a third or a half circle. The end of the line of agricultural pipes was encased in the wall with which the end of the filled in trench was faced (fig. 3).

On completion of the work on the two lines of contour drains, work was now commenced on the central stream of the valley. The stream was straightened and its floor graded at a slope of 1 in 250. A bed of rubble was placed in the stream and in this prepared channel concrete inverts were laid in a straight line and cemented together. Where bends were unavoidable they were made as wide as possible. Where the slope of the stream bed was too steep the inverts were cascaded to break the force of the flow of water down the invert channel after heavy rain, as the force of this storm water is liable to displace the slabs and inverts. The sizes of the inverts used were 9, 12 and 18 inches, according to the amount of water they were likely to carry.

Trees also must be cleared from the banks of the invert channels up to a distance of eight to ten feet as growing roots will displace the slabs and inverts later if they are allowed to remain, and moreover, grass will not grow well over tree roots and our ultimate object is a smooth grassy valley. Tree clearing in this connexion was an aspect of work we could not do with sufficient thoroughness as in Tekong the valleys were all heavily treed, and as we had to work with as much speed as possible we left in places trees which we would otherwise have felled; I hope these trees will be felled later.

The last measure to be taken was to level the floor of the valley as smoothly as possible after the open drains and subsoil drains of the system had been completed. Old earth channels dug years previously, possibly for irrigation purposes, were filled in with earth; earth ponds and wells and ordinary depressions in the ground were similarly filled.

A tributary valley entering Sphinx Valley on the right bank about half way down had also to be dealt with as *A. maculatus* were found there in seepages in the sides of the valley. The stream running down the valley flowed through a succession of pools which were fairly deep and dangerous. The valley was a good deal steeper than Sphinx and also narrower ; in the upper portion the invert channel down the centre had to be cascaded in steps almost all the way down to Sphinx Valley.

To dry up the seepages we put in a number of short arcs of subsoil drains along the right bank in the upper part of the valley. A few still shorter were also put in on the left bank ; these short drains were very successful in drying up the dangerous seepages.

THE ENGINEERING ASPECT OF DRAINING THE VALLEY.

In the foregoing account I have described the putting in of a subsoil drainage system in Sphinx Valley in detail as I saw the work carried out. But, although I asked for the work to be carried out, and described what I wanted done and why, it was the personnel of the Corps of Royal Engineers who did the work and it would be beyond me to describe how the making of surveys and the taking of levels, etc., is done.

I therefore asked Quartermaster-Serjeant Light, R.E., the foreman of works in immediate charge of this work on Tekong, to write a short account of this aspect of the work, which he very kindly did for me.

Quartermaster-Serjeant Light's notes on this subject run as follows :—

NOTES ON ANTI-MALARIA WORK AT PULAU TEKONG.

At first it was decided to drain two valleys, but the number was increased to ten owing to an outbreak of malaria resulting in several deaths. As the process for each is the same only one will be described.

(1) The first step is to decide on the area or extent of the valley to be drained by studying the map (if one exists) or by walking over the ground.

(2) The next step is to determine the amount of available fall from the head of the work to its outfall ; this is found by running a section of levels along the proposed line of the drain and carried out with the aid of a level which consists of a telescope mounted on three footscrews fixed to a tripod. On top of the telescope is a spirit level which is fixed parallel to the telescope. The spirit level (or bubble as it is commonly named) is brought to the centre of its run by manipulating the footscrews so that when the instrument is properly set up, all readings taken through the telescope will give the difference in level between the stations where the staff is placed. The staff is usually of wood, telescopic and fourteen feet long. It is subdivided into feet, tenths of feet and hundredths of feet.

The section of levels is run as follows. A picket is driven into the bed of the stream at high water level and the staff stood on it. The level is set up at any convenient spot and a reading taken on the staff. The staff is then moved to another picket along the bed of the stream about 50 feet away and another reading taken. Assume the reading at picket No. 1 was

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8.72 feet and the second was 7.84 feet, then the difference is a rise of 0.88 feet. The level is then moved forward, set up, and a back reading on to No. 2 is taken. The staff is then moved forward to No. 3 and read ; this gives the difference in height between 2 and 3, and so on.

Each change of direction is recorded by taking a compass bearing and also the distance between each station or picket, so that on return to the office, a plan and section of the ground can be prepared. The amount of fall having been found, the fall of the pipe line can be plotted on the drawing. From this drawing the amount of excavation can be estimated and also the stores required.

The size of channels and pipes can either be taken from a textbook or the flow measured, allowance being made for rainfall. The position and height of the outfall is next fixed by reference to the drawing. Excavation then commences at this point and the original course of the stream is followed as near as possible to save excavation, although a certain amount of straightening out has to be done. Level pickets are then driven every 15 to 20 feet, rising the required amount as shown on the drawing. The earth is excavated an extra 3 inches below the tops of pickets ; this space is filled with broken stone to form a bed for the drain. Half or one-third round pre-cast concrete channels in two feet lengths are then laid in straight lines with easy sweeping bends at changes of direction. Space is left between each channel to allow ground water to enter the channel. The earth is then trimmed back from the edge of the channel to a slope of 1 over $1\frac{1}{2}$ and pre-cast concrete slabs laid. The slabs are 18 by 18 by $1\frac{1}{2}$ inches. The joints between slabs are then pointed with cement mortar. The practice on Pulau Tekong has been as follows : Where the excavation is less than 5 feet, concrete channels are used, and for depths over 5 feet agricultural drain pipes are substituted. For agricultural pipes a slope of 1 in 300 is given ; for inverts 1 in 100 to 1 in 300. It was found that slopes of 1 in 200 or steeper were self-cleaning but inverts laid at 1 in 200 to 1 in 300 got choked with sticks and leaves and required clearing once or twice a week to prevent breeding. The agricultural drain pipes are laid in the same manner as the channels, except that the top two-thirds of the joints between the pipes are covered with puddled clay : this prevents sand and earth from entering the pipe while it allows the water to pass up through the bottom, in addition to percolating through the wall of the pipe to a very slight extent. Sometimes the depth of the trench is too great owing to steep ground ; in this case a step up in the pipe line is made by bringing a vertical pipe to the surface of the ground with two holes in its sides, one facing the original pipe line and the other on the opposite side at a higher level facing the new pipe line. The top of the pipe is covered with a concrete cap. Vertical pipes are also brought up every hundred feet or so, for inspection purposes.

Seepages were found in several places on the banks of the valley, to which short runs of pipe were laid discharging into the main. In Sphinx and Tekong Besar valleys the drains were dug through very sticky clay ;

therefore, earth was dug from the banks and filled into the trenches; the clay was used for filling depressions.

Washing places were provided in the main channels for local inhabitants and the holes originally dug by them were filled in.

In Sphinx and Tekong Besar Valleys the following stores were used :—

18 inch diameter half round inverts	..	..	..	1,322 F.R.
12 " " " " " "	..	..	..	1,455 F.R.
9 " " " " " "	..	..	..	1,644 F.R.
8 " " agricultural drain pipes	..	..	..	830 F.R.
6 " " " " " "	..	..	..	3,913 F.R.
4 " " " " " "	..	..	..	1,008 F.R.
18 × 18 × 1½ inch concrete slabs	..	..	approx.	3,000
Total F.R. of drainage = 10,172 F.R.				

The work took 258 working days with an average of 1 krani or overseer, 10 mandores or foremen, and 84 men per day. The pay of these men amounted to \$14,764.95 = £1,722 11s. 6½d.

In addition to the drainage work, 1,400 trees were felled and cleared away. The trees were felled for 25 feet each side of the subsoil pipes and 5 feet each side of the inverts. Big holes and large areas of low lying ground also had to be filled.

The labour was recruited locally (all Malays) and the men carried out the work very well considering that they were all fishermen and knew nothing about land drainage.

THE EFFECT OF THE DRAINAGE.

The most gratifying feature of this anti-malaria drainage work is the magical effect it has almost immediately. Before the work was finished off the unpleasant tropical swamp we had known a few weeks before had been replaced by a firm grassy valley bathed in sunshine thanks to the clearing away of the trees. This rapid result of their work may have been the reason why the personnel of the Royal Engineers concerned at once became warm supporters of the valley drainage work. Whether this was so or not, at all events the scheme was found to work better than we expected and the money it had cost was justified.

The real object of the work, viz., to eradicate malaria in the immediate neighbourhood was also very satisfactorily obtained, for malaria amongst the Chinese coolies living in the lines above the valley decreased steadily as the work advanced towards completion.

The malaria which had been occurring on the island about this time started in the Sphinx labour force. As the number of cases decreased at Sphinx the disease broke out in the Tekong Besar lines, about a mile and a half further to the East. Encouraged by our success at Sphinx we started a similar drainage scheme in the valley behind Tekong Besar which was similar to Sphinx Valley in most respects, but not so long. Here also *A. maculatus* was easily found in the larval state. We had started this work before finishing the Sphinx system. Working here along the same lines, we were rewarded with equally satisfactory results in that we got firm, dry, grassy ground and a controlled flow of surface and ground

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water, instead of a valley in which a stream meandered through a swamp. But here the malaria did not disappear so rapidly. It was not until later that with the assistance of the staff of the Rural Health Department, we found *A. maculatus* larvæ were breeding in the underground galleries. At entrances and at low points in these galleries, muddy, clayey water collected and in these collections of water, particularly below shafts, these larvæ were to be found. Up to then I had thought that *A. maculatus* would not breed except in the clear water of valley streams and seepages, but apparently the insect is not so particular when driven from its favourite breeding sites. Some difficulty was experienced in dealing with these breeding places as we could not oil them on account of the oil interfering with the setting of the concrete, but we used petrol successfully until in

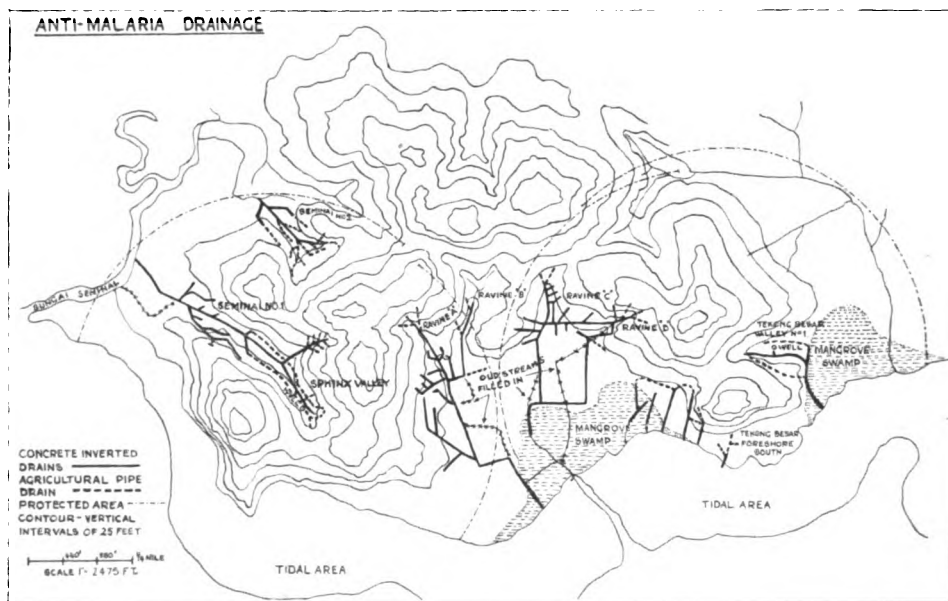


FIG. 4.

the course of the work the galleries were pumped dry. From this time the number of cases of malaria on the island has been negligible and no case has occurred amongst British troops.

In the meantime Dr. Spink, the Rural Health Officer, Singapore, informed us that, by virtue of the Anti-mosquito Ordinance of the Straits Settlements Legislation, and if the work was to be of public benefit, we could treat all swamps and valleys around our barracks up to the edge of a circle of half mile radius from the perimeter of the barracks in all directions, without having to buy the land we wanted to drain. This sounds simple but it must be remembered that we are dealing with a tropical island where the vegetation is very dense and where the rainfall is about 100 inches a year. Moreover, the greater part of the ground with

which we were now attempting to deal was only about a foot or two above high water level, and so the problem was rather one of water control than of subsoil drainage.

Fig. 4 is a contoured map of the area prepared by Quartermaster-Serjeant Light, to whom I am much indebted. The arcs of circles show the half-mile protection zones. From these it can be seen that the whole area has been nearly completely treated with the exception of a valley far out to the north-east of Tekong Besar. Experience has definitely shown that the nearer the breeding site, the greater is the risk of malaria, but this valley is separated by a well wooded and fairly high hill and so the risk of infection from this direction is probably slight. It is acting on knowledge such as this that priority of work is mainly decided. The work is done generally from the centre of the circle outwards. The actual presence of *A. maculatus* larvæ is the factor of most importance in deciding the order in which the work is to be done.

Commencing with the Sphinx Tributary Valley and the lower portion of Sphinx Valley the Royal Engineers now proceeded to carry out the drainage of eight more systems. These systems consisted largely of concrete surface drains designed to bring the sluggish, winding streams running over the flat plains almost at sea level into control and to replace them with straight, well graded, concrete channels by which the water was led off quickly to the sea. Further up their courses, where these channels can be made deep, a great deal of ground water flows into them through the spaces at the junction between the inverts. The gradient of these open channels is kept usually at 1 in 250 and this gives a fairly rapid flow. The total volume of water led away daily by the channels, therefore, must be many times that of the natural streams. But they must not be put in unless a good flow of water in them is assured.

Experience has had to be our teacher in this respect and has shown that where the channels were carried too far up the valleys, they are apt to run dry and tiny collections of water at the invert junctions can and do provide sufficient water for the *A. maculatus* larvæ to hatch out.

The four ravines shown on the map were originally four streams crossing a triangular plain, and except for putting in sub-soil drains around their source in the shape of a tennis racquet frame which had the effect of removing seepages, and starting off the concrete channel with a good flow of water, the remainder of the work consisted for the most part in straightening and concreting original streams. The chief problem here concerned the outfall to the sea. If the channel could be led into a tidal mangrove swamp all was well, but where the outlet was on a sandy beach, the difficulty of keeping the mouth of the channel free from silting up was considerable. The reason for this is that on all beaches in these waters a sand dune tends to form along the seashore a little behind the high water line. This sand dune is formed partly by silt brought down by the rivers in flood and partly by a combination of monsoon winds and high tides which tend to pile up the sand along

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the sea-front. Smaller rivers cannot break through this barrier and so are forced to deviate to right or left and run parallel to the sea. This is what causes lagoon and swamp formation.

To return to our problem, in this connexion we are now finding that we must either cut a channel for our drainage outlets deeply through the sand ridge and make it wide with strongly reinforced sides; or else we must tunnel through the sand and put in wide bore concrete cylinders leading the water channel out beyond the beach sand on to the beginning of the mud. Unless the outlet is wide and strong it not only silts up with sand brought in or banked up by the tide, but it gets readily broken up by the force of the waves.

FORE-SHORE DRAINAGE.

Our last effort on Pulau Tekong was to try the effect of reclaiming a foreshore swamp by means of underground drainage. Below the cliff to the south-west of Tekong Besar there was a swampy flat between the cliff and the sea. By putting in subsoil drains along the bottom of the cliff in the shape of horse-shoes, the sides of the horse-shoes forming the outlets to the sea, we were most successful in obtaining a firm, dry field in the centre of the shoe. This has been made into a football ground which is a most welcome asset to the troops of the Royal Artillery stationed there.

GENERAL REVIEW OF DRAINAGE WORK ON PULAU TEKONG.

For the benefit of the readers of this article who know the island of Tekong and who might rightly claim that the island has not yet been freed of mosquitoes, I must hasten to state that the work which I have described above has been designed almost entirely to eradicate the malaria carrying mosquitoes. *Aedes* and *Culex* mosquitoes, which are of course not carriers of malaria, still breed out of empty cocoanut shells and in the water at the bases of nipah palm leaves, and as cocoanut growing is quite one of the industries of the island, it will not be easy to get rid of these mosquitoes entirely. But so far as the object was to get rid of the anopheline mosquito, this has been very satisfactorily attained, certainly as far as *A. maculatus* is concerned. This mosquito is the malaria problem on Tekong, for *A. hyrcanus (sinensis)* and *A. kochi*, which are the other most common anopheline larvæ to be found here, are not regarded as malaria carriers at all. Although it is perhaps a little early to say so, yet it is the case that before the anti-malaria drainage work on the island was started, malaria was prevalent in an epidemic and virulent form; 79 per cent of the cases which occurred in the 1934 outbreak were subtertian malaria, of which a certain number were fatal. During the last ten months there have been no cases of malaria among the military personnel and employees living on the island, that is since the drainage work was nearing completion or completed in the more important valleys. I hope and believe that this state of affairs will continue.

(To be continued.)

AN AUXILIARY WATER SUPPLY AT CHERAT.

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AND

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To those who have read the extremely interesting paper on the water supplies of Gibraltar by Major Jameson in the *Corps Journal*,¹ the following account may appear to be rather tame and also to be a mere copying of methods. It is considered, however, that the auxiliary water supply at Cherat is of sufficient interest to justify the following account, as a barren hill top at the end of the Cherat ridge has been utilized to augment an existing scanty supply from springs.

Cherat is a small semi-hill station some thirty-five miles from Peshawar, on the southern bounds of the Peshawar vale, perched precariously on a rocky ridge which forms part of the foot-hill system north of the Afridi country. The barracks and quarters are placed along the crest of the ridge on several flat or flattish areas which form the main part of the ridge. The average height is 4,000 feet with a rise to 4,200 feet where the main reservoirs are built, and to 4,546 feet at the highest point.

The population consists of a mixture of troops and families with the usual crowd of civilians necessary in any such station. The total population is just over 2,000 in summer and 700 or more in winter.

The previously existing water supply consists of a spring supply half-way up the ridge on its north side at Chapri, and situated on the main road as it winds its way up the ridge. This spring water is pumped up 2,914 feet to the storage tanks on the crest of the ridge through 3-inch pipes. There is an approximate daily yield of some 37,000 gallons at good periods and daily some 22,000 gallons are actually pumped up to the storage tanks.

Distribution from the storage tanks is by ordinary pipe system as far as it will extend.

There is no other source available except rain-water from the roofs, which is collected and stored locally for sets of quarters and bungalows.

The eastern end of the ridge is completely unoccupied, and rises to an elevation nearly as high as the highest point of the main ridge, and above the level of the main storage tanks. This raised eastern extremity is partially flattened and hollowed out into a half saucer.

¹ "The Municipal Water Supply of Gibraltar," by Major G. D. Jameson, *JOURNAL OF THE ROYAL ARMY MEDICAL CORPS*, vol. lxx, No. 2, August, 1935, pp. 73-84.

It is this raised eastern extremity which has been converted into an impervious catchment area to augment the supply from the springs by means of an impounded rain-water supply.



FIG. 1.—The smooth slope leading down to the storage tanks. The distant view is southward down the Indus River.

The average rainfall of Cherat is 27 inches, which is divided into two portions: winter rains and snow in January and February, with occasional storms in April: and intermittent rain storms in July to September.



FIG. 2.—General view of the storage tanks showing the southern wall with collecting channels and spill way to the steep khud on the left. The main part of the ridge with its highest part and the barracks can be seen in the middle distance on the left. The distant hills on the left are in tribal territory.

An area of approximately one square mile of rocky ground, which is at, or above, the level of the catchment area storage tanks, has been fenced in; and most of this square mile has been concreted and cemented.

The area, although mentioned above as being flattened out into a half saucer, is by no means ideal or easy to deal with ; and considerable ingenuity has been used in turning a rather unpromising piece of ground, which slopes rapidly down to a precipitous khud side, into a catchment area and storage accommodation.

This has been done by building up a wall along the southern lip of the half saucer and building the tanks in the space so provided. The waste spill way and the distribution pipe lead off from this wall.

There are two tanks with a total storage capacity of about 875,000 gallons. A collecting channel surrounds these and carries the water round to the common entrance channel, thus preventing direct flow of water to the side of the tanks.

Arrangements are made in the common entrance channel to connect up with the spill way, discharging down the southern hill side. A small

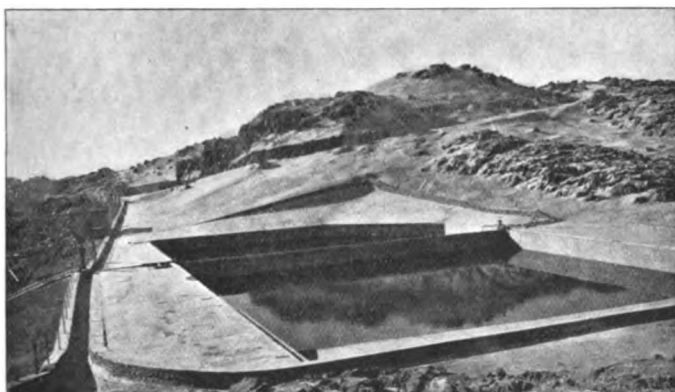


FIG. 3.—The storage tanks with final collecting channel on the left, spill way and common entrance channel.

trap gate controls the flow, so that the initial rush of water, which may be dirty from deposits of dust, can be discharged down the hill side. The trap gate can then be closed to allow the tanks to fill with the clean supply.

A watchman lives on the premises, whose duty it is to deal with this control trap. Sudden storms form a considerable part of the average rainfall, and proper control of the initial and possibly dirty water is essential if repeated cleansing of the storage tanks is to be avoided.

The distribution pipe being connected with the main supply system these tanks can be utilized as extra storage for the main supply.

The main distribution and storage tanks of the previously existing supply, however, lie only at a height of some ten feet below these storage tanks of the catchment area. The fall over the distance of a couple of miles is therefore very slight and distribution of this supply is only easy to the nearer and lower portions of the barrack area.

The work necessitated the removal of a considerable quantity of low scrub and small trees, and it is likely that growth from the roots and seeds of these will give trouble for several years, and necessitate repeated repairs to the surface.

The ground surface, where soil was found, was smoothed and rammed before the concrete surface was applied. A concrete surface of three inches in thickness composed of one part of lime, two of sand and six of aggregate, has been used and has been laid down in small sections. As can be imagined this has been quite a laborious proceeding, and the provision of water for work has, at times, been difficult.

For rocky surfaces the concrete has been plastered on to, and into, all hollows and rammed home as well as possible. This has been very necessary on the eastern hillock, where the strata are almost vertical, and



FIG. 4.—Showing the method of cementing to the top of the water shed. The bare piece of ground on the right drains in the opposite direction away from the storage tanks.

consequently natural absorption great and surface flow small. Fig. 4 shows well the very broken surface which it has been necessary to make impervious.

A cement surface, composed of one part cement and two of sand, has been, or is being, applied to the concreted areas as soon as they are ready. This secures a good, non-absorbent, clean drainage surface.

In addition to the collecting drains round the storage tanks, which collect from the saucer portion of the area, lateral drains have been constructed below the cemented areas right round the western and eastern hillocks and along the higher eastern edge of the area. These drains all lead to the common collecting drain shown in fig. 3. The initial flow of water from all surfaces can therefore be run to waste, if dirty; and then, when clean, run into either storage tank as required.

The chances of dangerous contamination of this supply are small. The area is situated at the end of the rocky Cherat ridge, which is unoccupied

for nearly a mile, and separated by a depression from the main ridge. The area is surrounded by a good stout wire fence and very steep unoccupied hillsides offer no inducement for traffic, other than the grazing of a few goats. Contamination, therefore, should probably be limited to that due to birds and dust, and is unlikely to be dangerous.

It is not possible to give the total cost or the final results of this scheme, but, from the data available at present, the scheme fully justifies itself and should form a valuable adjunct to the previous, somewhat restricted, water supplies.

It is hoped that this account may prove to be of value to others concerned with increasing the water supply of small isolated stations in which existing supplies are unsatisfactory.

MEDICAL SPECIALISTS' MEETING.

THE second annual meeting took place at the Royal Army Medical College, on October 14, 1936, when there was a large attendance of Specialists in both Medicine and Mental diseases. The Consulting Physician in opening the meeting referred to the very favourable reception accorded to the first one held in 1935 and to the practical value of Dr. Cotton's paper on that occasion.

The proceedings began with the reading by the Chairman of a communication received from Major F. M. Lipscomb, M.R.C.P., on Anxiety Neurosis, which was the subject chosen for this year's discussion. A paper by Dr. E. Mapother, M.D., F.R.C.P., F.R.C.S., followed, after which a general discussion took place, addresses being given by Lieutenant-Colonel H. Gall, Dr. Aldren Turner, M.D., F.R.C.P. (Neurological expert to the War Office Medical Board), and Major J. Bennet.

The Director-General addressed the meeting for a few minutes on the subject of medical training in preparation for active service and the duties of specialists in connexion with that training.

The various papers will be published in this Journal as opportunity offers. The Chairman at the close of the meeting asked for suggestions for subjects for next year's meeting (1937) to be sent in by the end of 1936.

CONTRIBUTION TO DISCUSSION ON ANXIETY NEUROSIS IN THE ARMY.

BY MAJOR F. M. LIPSCOMB,
Royal Army Medical Corps.

SINCE the greater part of my service has been in India may I be permitted to offer observations on certain aspects of anxiety neurosis as it is encountered in that country.

I must make it clear that my conclusions are based on clinical impressions and are not worked out from statistical records. Psychoneurosis is seldom recorded officially unless it is the cause of invaliding. Even then it is often hidden under the name of a symptom, such as "tachycardia" or "hyperthyroidism": and I think rightly so. To label a man "neurotic" does not improve the chances of recovery.

The basic cause of anxiety neurosis is maladjustment to some form of fear: the manifestations in any given case are the result of the interaction of the individual's personality and the kind of psychical strain to which he is exposed. These factors vary enormously, but they seem to fall into groups corresponding more or less to certain classes. A convenient classification is by ranks :—

Indian Other Ranks.

Here anxiety neurosis is rarely seen, whereas hysteria, usually in the form of hysterical paralysis, is relatively common. I am inclined to think the reason is a certain fatalistic attitude to illness. The matter would repay study by an expert psychologist whose conclusions might throw light on prevention of the disorder among other classes.

British Other Ranks.

The type of personality appears to determine the type of symptoms caused by psychopathic reaction to fear.

The less intellectual and less educated soldier is likely to exhibit the phenomena of hysteria; the more intelligent and better educated individual, typically seen in technical corps, tends to suffer from anxiety neurosis. As a side-note I would remark that I have never encountered any kind of psychoneurosis among Other Ranks of the R.A.M.C. in India. Perhaps recruiting medical officers are careful in selection of suitable types for their own Corps, or perhaps the Corps training gives its members a sane attitude towards physical and mental illness.

Throughout the Service soldiers employed for any length of time as clerks seem prone to suffer. Particularly is this so in the clerical establishments of headquarter formations. The clerks' rooms in military offices in India are not usually notable for brightness and cheerfulness; life spent in them is both physically and psychically unhealthy. Many of these men are married and hold an acting rank or a well-paid appointment: they are fearful lest a period of sickness may involve loss of that rank or of an appointment.

The British Other Rank in India is deprived of home life for a period of years. Even for the *married* man his quarters in the married lines scarcely constitute a "home." In the Punjab, for example, this so-called home is disorganized by a move of his family to the hills for the six hot months of the year. On their return he himself probably goes to camp. In fact he is lucky if he is with his family for more than four months in the year.

The *unmarried* man is practically cut off from the company of the female of his own kind. He is sexually starved—using the term in its fullest sense. Association with prostitutes or homosexual indulgence does not solve the problem. It is not only sexual gratification that is needed—it is feminine companionship of the kind he can enjoy in England. In the rather highly-strung type that is apt to become neurotic nervous strain is often mitigated by feminine influence. Regimental officers have told me that they are convinced that absence of feminine society is a common cause of abnormal conduct.

Another factor is the unsuitability of certain men for military service in the East. An example is the young soldier who comes under observation in India for some disability in which anxiety is a prominent symptom:

his medical history sheet usually shows that during service at Home he was frequently in hospital with minor complaints, and it may contain a remark that he was neurotic or introspective. Such a man is seldom able to pull his weight in the East.

Officers.

Anxiety neurosis in young officers differs from anxiety neurosis in senior officers. In the former it depends more on personality ; in the latter more on intrinsic influences.

A few years ago the *young officer* arriving in India sometimes showed excessive regard for his health ; he lived with a clinical thermometer in his pocket and, on the least departure from a feeling of well-being, retired to bed and sent for the medical officer. These young men had been born during the Great War and brought up in the period immediately following it. The causation of their lack of psychical stamina was injudicious care of their health in childhood, a "hang-over" of the influence of maternal anxiety at that time. Fortunately many were cured by regimental discipline. Nowadays such cases are rare.

Among *senior officers* the problem is more serious. Anxiety is common and impairs the efficiency of good officers in a responsible position. Colonel Heatly-Spencer has suggested that it is a legacy of strain during the Great War.

The intellectual, highly-strung, conscientious officer is the most apt to suffer. He often has great responsibility and has years of experience to enable him to shoulder such responsibility ; yet, in giving effect to his decisions, he is fettered by masses of regulations with complicated amendments and a sense of impotence engendered by the stranglehold of the finance branch. In a recent case of which I am aware, a conscientious officer had discovered that the rate paid in certain contracts for which he was responsible was slightly above that which would have been most economical. In renewing the contracts he secured a reduction. Instead of his being congratulated, his superior was called upon to report what disciplinary action had been taken on account of the previous loss ! The senior officer responsible for spending public money is in a constant state of anxiety lest a financial scandal may come to light in his department. One such officer told me that he feels as if he is living on a volcano.

Many officers marry rather late in life so that heavy expenses for education of children come at a time when selection for promotion is of the utmost importance. At the same time their wives, on whom they have come to depend for spiritual support and a comfortable home, may be in England looking after the family.

Confidential reports are another cause of worry to senior officers. The searching and necessary special physical examination now made in the case of colonels and more senior ranks has resulted in unexpected invaliding. Uncertainty as to the outcome of this test is further reason for anxiety.

The strain of all these worries induces a state of nervous exhaustion—neurasthenia—to use that now unfashionable term. Feelings of fatigue, indigestion or what not become prominent; the sufferer begins to fear he is developing “blood pressure” or cancer, and visualizes early invaliding without having secured the pension which will keep his family in comfort. This worry again prevents him giving whole-hearted and care-free attention to his work. And so the vicious circle is complete.

Women.

Owing to the medical care of women forming a greater proportion of military medical practice in India than it does at Home, psychoneurosis among them frequently comes to the notice of the medical officer; and it requires special consideration both for the sake of the victims themselves and to prevent deleterious effects upon the military efficiency of husbands. The great majority of European women in India do not suffer from anxiety neurosis any more than they do in England. But among the unfortunate minority who have a neurotic tendency, I think the determining causes are different. While at Home they become over-obsessed by small difficulties in the house, in India their troubles are apt to result from lack of settled home life. During service abroad a woman is frequently separated from husband or children, or both. Celibacy—in the figurative as well as in the literal sense of the word—is not a natural state, but the psychologically stable majority survive temporary periods of it with impunity. Of those not so endowed, some succeed in sublimating the sexual impulse into other activities, others become involved in open or clandestine amorous adventures. The latter relationships are not capable of the fulfilment of happy married life and they result in a state of tension prone to develop into anxiety neurosis. A not uncommon, but specially unhappy example, is the woman whose charms are beginning to wane and who is not receiving the affection she needs. Not only is she in a state of anxiety but subconsciously she may attempt to obtain sympathy by symptoms of physical illness.

As regards Indian women, the younger ones tend to manifest psychoneurosis in the form of hysteria. When they get older and their attractiveness begins to diminish, the same phenomena may be observed as in the case of Europeans.

Children.

The “nervous child” is, in my experience, rare in India, both among Europeans and Indians.

Before discussing prevention and treatment two other ætiological factors deserve mention, namely the influence of alcohol and the influence of physical disease.

Alcohol.

Efforts have been made to relate the prevalence of drinking with the incidence of anxiety neurosis. As regards India, there is no doubt that the consumption of alcohol has greatly diminished in recent years. It is not so easy to ascertain whether there has been any real increase of anxiety neurosis during the same period. Many officers, medical and others, consider that this relative temperance is the cause of more anxiety. Who can imagine a beery "Old Bill" with anxiety neurosis?

Further, alcoholic psychosis differs fundamentally from anxiety neurosis : in the former (except during the acute stage of delirium tremens) physical signs of fear are absent, whereas in the latter they are a characteristic feature. Prolonged anxiety may make a man take alcohol to relieve mental strain : the drug is not the cause of the anxiety. Under certain conditions a timely dose of alcohol may be a valuable therapeutic measure, but one hesitates to recommend it indiscriminately because the incipient neurotic is of that unstable temperament that cannot be trusted to control its use.

Physical Disease.

To assess the influence of physical disease is very difficult. First comes the problem of determining to what extent symptoms are merely subjective. Secondly, when physical disease is discovered, how far is it causative? Is, say, chronic toxæmia so sapping a man's stamina that he has become anxious, or has mental strain rendered symptoms obvious which in normal mental health would have passed unnoticed? Correct solution of the problem in any given case is of crucial importance. If physical disease is the real cause, then its relief may cure the mental disorder ; if it is *not*, then elaborate investigations and prolonged treatment will probably make it worse.

Experience in India leads me to believe that physical disease is rarely truly causative. But there are two exceptions to this generalization, namely, chronic amœbiasis and chronic paranasal sinusitis. When either of these is present cure of the infection is often followed by rapid improvement of the mental state.

Prevention and Treatment.

I shall not touch upon the all-important matters of careful recruiting and subsequent training. They apply to the Army as a whole and are not peculiar to Eastern service. Special precautions, however, should be observed when sending officers, soldiers and families to India. The first two classes are specifically examined as to medical fitness before proceeding overseas ; this examination should be a searching test and should include psychological fitness in view of experience gained during service at home. Surely it is more economical to invalid an unsuitable man straight away than to have him sent back after spending the greater part of a year in and out of hospital in India?

Lectures are given to troops and families before they arrive in India,

and these should embody instruction in tropical mental hygiene, the importance of which has been emphasized by Castellani. Whilst common sense practical lessons in personal tropical sanitation are necessary, care should be taken not to paint a picture of a land seething with fell diseases from which one is lucky to escape with health more or less intact. I have known women and children arrive half starved at their destination up-country because the dangers of enteric, dysentery and cholera have been so impressed upon them that they have been afraid to take food or drink on the train. Those who embark upon foreign service in a spirit of adventure seldom suffer from anxiety neurosis.

Next to the time at the Depot at Home, the settling down to new experience in the East is an important period in preventing neurosis. A happy unit, in which all ranks, including their wives, are on good terms and have the welfare of the whole at heart produces very few cases of neurosis.

The problem, mentioned above, of finding a remedy for the Other Ranks' deprivation of social life is not easy of solution. One regiment I know of has made the experiment of mobilizing all its feminine resources by means of All Ranks' dances. More might be done on these lines.

Treatment falls under two headings: namely, treatment in the stage of early symptoms and treatment of the established disease.

Treatment in the stage of early symptoms lies almost entirely in the province of the Regimental Medical Officer. If he knows the characters and personalities of officers, men and families in his charge, he is able to appreciate the earliest signs of psychical strain and, with or without consultation with a regimental officer, to devise a remedy. He should occupy the position of a trusted family doctor who is friend and counsellor in many difficulties besides actual illness. On him must fall the responsibility of deciding how far physical disease is the cause of symptoms. Neurotics should be kept away from hospital as much as possible because they are naturally introspective, and the atmosphere of hospitals tends to increase their interest in themselves. Once introspection is fixed cure is extremely difficult.

As in civil life the neurotic woman is greatly dependent upon sympathy and sound advice from her doctor, a dependence that is sometimes embarrassing. She is a trial to the Medical Officer of the unit; nevertheless, by listening to her troubles, calming her fears, giving encouragement and treating symptoms where necessary, he may prevent establishment of a definite neurosis.

The responsibility of the Regimental Medical Officer is so well known and so clearly laid down in regulations that at first sight it seems unnecessary to mention it; but I have done so because, under present conditions in most large stations in India, a medical officer seldom remains in charge of a unit for more than a few weeks at a time. It is then, of course, quite impossible for him really to get to know the individual components of his

charge and consequently he cannot help them in the way he ought to. A remedy for this unsatisfactory state of affairs deserves the earnest consideration of administrative Medical Officers.

Treatment of established anxiety neurosis varies according to the type of patient.

The disorder in the young soldier is determined more by personality than by outside influences. Except in the comparatively rare case with a temporary or removable cause it can only be relieved for a while, and the victim soon relapses into a worse state than before. Such a subject is never likely to be fit for active service in the East, and, under peace conditions, invaliding to the United Kingdom is the only course.

In older individuals, and in certain cases young people too (for example those who endured the Quetta earthquake experiences of 1935), the anxiety state is due not so much to inherent psychical defect as to prolonged or exceptionally severe nervous strain. With this class of case the essential measure in treatment, in India as anywhere else in the world, is to restore and maintain the patient's morale and confidence in himself. In addition he needs prolonged mental rest and this involves a period of leave. Leave to England is usually the more beneficial though leave in India may suffice for slight cases. It is all important that confidence in complete recovery should be established before the leave begins. It is no use recommending leave in India unless it is certain that the patient is going to enjoy some form of recreation, for example, shooting, fishing or sailing, on which he is really keen, and which, without overtaxing his physical strength, will give him mental relaxation and rest. Vague search for amusement in a hill station does more harm than good.

With women the causes are so often connected with conditions of life in India that, in an established case, nothing short of a period of change out of the country is of real avail.

In conclusion, may I suggest that, while hygiene has achieved remarkable and solid progress as regards the *physical* well-being of officers, troops and their families in India, there still remains much room for advance in *mental* hygiene.

WAR NEUROSIS.

By E. MAPOTHER, M.D., F.R.C.P., F.R.C.S.

MORBID anxiety is the tendency to the occurrence of fear which is either independent of events that would cause fear in a normal person or out of proportion in duration and intensity to any such events.

Various aspects of that definition will need elaboration later. It may be well in the first instance to distinguish between the mental disturbance of morbid anxiety and on the other hand the physical disturbances which accompany these, although it should be emphasized that these are only the same thing from different view-points, that of the sufferer and of the onlooker.

In the first instance, it is necessary that I should mention (without particular reference to causation) a number of clinical forms in which the *mental* disturbance of morbid anxiety can manifest itself.

Firstly, it may take the form of general timidity—that is, universally exaggerated response to all such situations as would cause fear in a normal person.

Contrary to what might be expected, this clinical form of anxiety is comparatively rare. A very high proportion of cases of anxiety neurosis have no particular fear of ordinary physical risks such as those involved in driving a car at high speed. Indeed, many of them are a danger to themselves and others because they are constantly trying to prove to themselves that they are not cowards.

Secondly, in other cases of anxiety neurosis while there is no general timidity there is a liability to be upset to an exaggerated degree not by *all* but by *one* of the particular situations which may frighten normal people. Such a patient may be terrified either by loneliness or the presence of crowds, or by dealings with superiors, or by loud noises, or by heights, darkness, or by closed or open spaces and so forth.

Thirdly, the patient may be terrified by some object or situation that would have no frightening effect whatever upon the ordinary person, but which for him has acquired significance as a conditioned stimulus. Among such an object may be knives, meat, harmless animals, etc.

In some cases a stimulus of a very simple kind is effective. It is particularly in such instances that the connexion is apt to be intelligible and to be obviously of the same kind as exists in an experimental animal for whom some meaningless experience has gained the power to evoke a conditioned response.

In the classical experiments of Pavlov a dog first salivates on being shown meat. If a bell of a certain note is rung at the same time as the meat is shown (or immediately before this) the bell eventually becomes effective alone and will produce the salivation in the absence of the meat.

In the trenches it was customary to bang a suspended shell case as a warning signal at the beginning of a gas attack. Many men were mystified afterwards in civil life to find themselves overcome with terror at the sound of a bell of similar note.

The fear response here is exactly comparable to the salivation of the dog. It may involve no recollection of the extent for which the bell has formerly been a signal.

A thoughtful Government had placed the shell shock hospital of which I was in charge during the last year of the War adjacent to a factory which made aeroplane engines.

When these were started up for a bench test numbers of the patients went into paroxysms of fear without exactly knowing why.

On the original Armistice Day just before eleven o'clock the shell shock patients of the Maudsley Hospital were lined up on the front drive

awaiting the lorries which were to take them for a tour of the town. The end of the War was signalled by the maroons which had hitherto been the customary warning of an air-raid; "shell shockers" fell down in heaps on the ground.

In many cases of anxiety the patients at intervals are seized with panic for which they can identify no cause whatever at the moment. Probably some obscure stimulus which has become conditioned but which they do not identify starts the panic.

In still other cases the origin of the phobia is to be found in a remote experience of the patient's early life—usually one with which fear was associated.

During early stages of the anxiety neurosis of war, and often for reasons unknown, the patient had at intervals a complete dissociation of consciousness. In such attacks his awareness of his current environment would entirely fade out for the time being and he lived again the events of some trench raid or similar episode which had formed part of his war experience.

In a much larger proportion of cases the patient suffered from what were called battle dreams. At first these usually reproduced faithfully real events of the patient's past; later they tended to portray imaginary scenes which were like in kind but had never actually occurred. Finally, even these might be replaced by imaginary scenes which, though terrifying, dealt with events of civil life rather than the war.

So far I have dealt mainly with the mental rather than the bodily aspects of anxiety states, but for many practical purposes the physical accompaniments are of such importance that I shall devote most of the rest of my time to consideration of these.

Before doing so it is necessary to say something about the causation of anxiety states. Into the causation of them, as of all mental disturbances, there enter factors which can be classified under four headings:—

- (1) Those due to the innate structure and tendencies of the individual.
- (2) Those due to disturbances of the adjustments which are experienced during the main epochs of life and its main physiological events, e.g. those of sex life.
- (3) Traces left by mental experience remote or recent.
- (4) The influence of more grossly physical factors upon the body.

Mental disturbances in which factors of the last physical group are operative are termed organic.

The cases in which such factors are not discoverable but have to be referred entirely to the influence of heredity, to epochs, and to mental experience, are termed functional.

A distinction is sometimes drawn between anxiety neurosis and other states of anxiety, such as agitated melancholia. Such distinctions between neurosis and psychosis are somewhat artificial, but they correspond roughly

to the fact that mental disorder may be termed neurosis (1) if it is mainly psychogenic and therefore amenable to psychological treatment; (2) if the patient has insight, is co-operative, and therefore unlikely to require any sort of restraint or compulsion.

It is necessary next to consider the nature of fear and the somatic and visceral accompaniments of it, and the relation of these to the autonomic nervous system and endocrine secretions.

It is quite impossible to identify physical accompaniments of fear with isolated activity of one or other of the antagonistic states of nerves which make up the autonomic system. One cannot say simply that these manifestations uniformly correspond either to the distribution of the sympathetic or parasympathetic. One might be more inclined to refer fear to the activity of a centre in the hypothalamus, but even this would seem inadequate because of the variable and even opposite manifestations which may be seen in different stages of fear. Thus one may see the cold goose skin of horror or the hot flushed sweating skin of the terrified man attempting escape.

In sudden fright a man may catch his breath and hold it. Later he may be gasping. He may be tense and rigid or prostrate and totally relaxed.

Probably it would be best to say that fear is a somewhat vague term for a variety of responses that occur in situations of danger. An animal may show calm efficiency or orderly flight or may flutter about in a futile way. It may become immobile with rigidity or collapse. Human beings show, in such situations, as one extreme the calm confidence that can hardly be called an emotion. Passing from this one knows the pleasant thrill of a danger with which one feels certain of coping, the anxiety associated with uncertainty about being able to cope with it, and finally the agony of helpless despair.

It would seem that the physical basis of various types and stages of fear are, on the one hand (*a*) adjustment according to requirements between various reaction patterns which are innervated by antagonistic sides of the autonomic system, or on the other hand (*b*) a failure of such adjustment.

It is possible to frame a list of the actual physical changes seen in fear and the occurrence of these in high degree out of proportion to any present cause is the essence of states of morbid anxiety. Such a list would include the following: Endocrine and metabolic changes; increased activity and sometimes enlargement of the thyroid; secretion of adrenaline; mobilization of sugar in the blood by conversion of glycogen from the liver; rise of basal metabolic rate, etc.

Fear heightens activity on the afferent side of the nervous system and changes accessory to this. It also causes excessive reaction of all sensory stimuli. Results include the wide staring eyeballs, dilated pupils, also photophobia and the exaggerated sensitiveness to sound seen in some anxiety cases.

There is also overactivity on the motor side, increased tone, exaggerated reflexes, tremors, and the startings which represent as it were incipient movements of flight.

As regards *the circulatory system* there is a general rise of blood pressure and contraction of blood vessels with such distribution as to produce maximum efficiency. The blood in fear shows a tendency to clot quickly, a fact which indicates the biological origin of the emotion. The beat of the heart is rapid and may be irregular. In morbid cases there may be persistent sinus arrhythmia or paroxysmal tachycardia; in long-standing cases hypertrophy and dilation may follow and if this is accompanied by a bruit organic valvular disease is very apt to be diagnosed.

In anxiety cases vago-vasal attacks of pseudo angina occur. I have been struck recently by a number of such cases in which generalized anxiety is associated with a history of intermittent claudication. It is probable that this more or less localized form of sympathetic overactivity is associated with the diffuse mental disturbance we call the anxiety state because the latter is prone to occur in those persons predisposed to it by sympathetic excitability.

With regard to the respiratory changes seen in anxiety neurosis during the early stages aphonia is one of the commonest symptoms. A sort of asthmatic dyspnoea with a sense of oppression in the chest is probably related to this and due to bronchial spasm. Just as ordinary asthma of civil life is commonly the combined effect of several factors among which may be bronchitis and a neurotic disposition, so much of the intense dyspnoea seen in the later stages of those who had suffered from gas had a large neurotic factor.

That laryngeal and bronchial spasm should occur as the result of morbid anxiety illustrates my point about the impossibility of ascribing all the results of fear consistently either to the sympathetic or parasympathetic overactivity; whereas most of the circulatory effects mentioned suggest sympathetic overactivity, the respiratory effects suggest rather overaction of the vagus.

The same is true regarding changes in the digestive system. Nausea and vomiting are common; there may be excessive secretion of a hyperacid gastric juice and in civil practice attention has lately been drawn to the large number of gastric ulcers, of which the start can be dated from a period of morbid anxiety. All this must be ascribed to the vagus. Diarrhoea and polyuria are other evidences of anxiety (commonly seen in connexion with stage fright in examinations) and these are presumably due to overaction of the sacral part of the parasympathetic.

Probably the mucous colitis which has a large neurotic element is of the same origin.

The importance of an exact knowledge of the visceral accompaniments of anxiety neurosis can hardly be exaggerated.

A. Anxiety neurosis due to protracted fright, whether of the generalized variety or in one of its more localized forms, is apt to be mistaken and treated as organic. This occurred during and after the War for several reasons.

(1) It occurred owing to the materialistic blindness of doctors common at that time, and also owing to what, without offence, one may call the militarist blindness which some thought it their duty as officers to adopt towards the existence of fear. This blindness was more common among a type whom a combatant officer called "the fire eaters of the field ambulances" than among men who passed most of their time in the line. False shame accounted for the invention of the term "shell-shock" and such absurd theories as that a considerable proportion of such casualties were due to poisoning by carbon monoxide gas resulting from the explosion.

(2) Another factor was the self-respect or vanity of the patient. It was easy to repress from consciousness awareness of fear but less easy to quell the bodily disturbances.

The case of mistaking for local and organic disease what was really due to protracted fright was still greater in the later stages when the manifestations had become focalized; I mean when the man had settled down with so-called asthma or D.A.H.

B. Of course the exactly contrary error has been quite common in connexion with anxiety neurosis. (1) A *generalized* anxiety state may be due not to fright but wholly or largely to organic causes. Among the commonest of these are post-infective states (e.g. trench fever, alcoholism, hyperthyroidism, and in later life arteriosclerosis). (2) *Focal* disturbances of the autonomic system (such as D.A.H., paroxysmal tachycardia, asthma, hyperchlorhydria) may also occur as the result of organic causes affecting physically the same autonomic centres as are upset psychogenically in anxiety neurosis. In a time when anxiety neurosis is prevalent these organic causes are apt to be dismissed as "functional."

Dealing in quantity with neuroses of war one gets referred to one by mistake large quantities of organic cases. In most instances discussion of such reference is not worth while, because to put the matter simply it is just a result of not having got a proper history, of not examining the patient or of sheer ignorance. This covers the reference of such conditions as epilepsy, alcoholism, G.P.I., encephalitis, disseminated sclerosis, cerebral tumour, arteriosclerosis and premature senility. I have had numerous instances of all these conditions referred to me as post-war neuroses.

There is, however, a group of conditions in which doubt is legitimate because the syndrome may in different patients be due either to organic or functional causes. In a particular patient the real question is generally in what degree symptoms are due to the one or the other.

Among such conditions are D.A.H., paroxysmal tachycardia, syncopal attacks, vasovagal attacks, intermittent claudication, asthma, diarrhoea, minor hyperthyroidism.

I wish now to go back to the psychogenic causation of anxiety neurosis. This may be due to many circumstances besides physical fear.

We can take in the first place cases indirectly related to physical fear; one may mention those in which a previous attack of ordinary anxiety neurosis which has subsided is revived in full force by some stress other than fear. I saw this occur in several instances during the War owing to men getting news during convalescence of the adultery of their wives. During the late years after the War it has commonly resulted from death of wives, loss of employment and other civil stresses.

There is no doubt that anxiety neurosis leaves a permanent susceptibility of this kind.

During the War a potent factor was often rather fear of fear, that is of making an exhibition of oneself rather than of the actual danger.

Allied to this is the anxiety neurosis which may develop owing to the sense of unfitness for one's responsibilities. This may be real or may only exist in one's own opinion. That is closely related to the anxiety neurosis from moral conflicts which is common in civil life.

This brings me to the question of the relation of anxiety neurosis to sex disturbances. Anxiety neurosis was originally discriminated by Freud and though he did not assert that it was quite constantly and specifically related to sexual disturbances, he emphasized these as the predominant factors.

He defined two characteristic situations giving rise to it. The first such situation was that in which repeated sexual excitation occurred without discharge of it, for example, in engagements of long standing and in marriages in which coitus interruptus was practised without satisfaction of one spouse.

The second situation was that in which previously excitation and discharge had been habitual and no discharge was occurring now. Typical instances were the situation of the "grass widow" and the reformed masturbator.

The insistence on the sexual ætiology of anxiety neurosis which had been suggested by Freud was carried to extravagant lengths by his followers. Speaking of anxiety neurosis Stoddart says, "The patients exhibited abnormal terror in the presence of any real danger such as an air-raid, which often caused them to fall into a state of collapse. The reason for this will be obvious to every psychologist who has made a study of the unconscious, and the most superficial analysis of such patients reveals a phallic significance of symbolism in their mind of zeppelins, aeroplanes and bombs" !

Despite this exaggeration there is a measure of truth in Freud's view. As a preparation for orgasm there does occur intense activity of the sympathetic and a heaping up of adrenalin such as accompanies other forms of effort. Erection is purely parasympathetic and up to the moment of orgasm is accompanied by inhibition of the activities which

constitute orgasm. But during sex excitation including coitus there is a heaping up of adrenalin and sympathetic excitation which suddenly reverses the balance and leads by "rebound" to the phenomena of the orgasm. If such heaping up becomes habitual and is not expanded then it may accumulate and form the basis of what one can call the effort syndrome. Manifestations of this may be anxiety, jumpiness, restlessness, craving for excitement.

While it is probably true as just indicated that unrelieved sex excitement may lead to anxiety, the reverse is even more true, viz. : that primary states of anxiety lead to sex excitement and discharge. This probably accounts for the orgies which have sometimes been seen in besieged cities. A remarkable instance was one described by Karl Pearson under the title of "The Kingdom of God in Munster," the story of the siege of a city of anabaptists during the Thirty Years War. Something similar was commonly seen among soldiers with shell-shock. Many of them complained of recurrent emissions both by day and by night, frequently accompanied by no erotic feeling and not preceded by erection. These symptoms often added greatly to their anxiety on account of the popular belief (mainly superstitious) about the devastating effects of such discharges.

An interesting phenomenon is the sexual hyperexcitability which is seen as the result of purely *organic* states of anxiety. This is particularly common in anxiety of the elderly. Many women, even those who have led sexless lives until after the menopause, become prone to spontaneous orgasms in later life. Their mental reaction to the situation varies widely.

In a large proportion of cases the relation of coitus interruptus and anxiety is exactly the converse of that stated by Freud. Anxiety is primary since coitus interruptus is being practised by the woman who fears pregnancy. Every act of coitus interruptus is an occasion of fear which aggravates the lasting anxiety.

I have mentioned other mental causes than physical fear for anxiety neurosis. It is well also to remember that this forms a phase of various psychoses. It is common in the early stages of schizophrenia and a phase of manic depressive psychoses and particularly in involutional melancholia.

Above all, and especially in military cases, it has to be remembered that the symptoms usually due to anxiety may be simulated by hysteria, or combine with this, or be protracted by this or replace this.

There is no hard and fast distinction between hysteria and malingering. At two extremes they are quite different. In the extreme case the symptoms of hysteria are dissociated—that is automatic and the patient is unaware of intention or motive to deceive. In the extreme case the acts of the malingerer are voluntary and deliberate and he is fully aware of intention and motive to deceive. But there are many gradations.

In hysteria, therefore, as contrasted with pure anxiety neurosis one is apt to find some of the following points: (a) A typical attitude towards

symptoms, namely, an emphatic repudiation of mental origin; (b) frequently a refractory attitude towards discipline and occupation; (c) indifferent attitude towards treatment and recovery; (d) evidence of faulty moral sense in other relations, e.g. general untruthfulness, financial dishonesty, and the meaner kinds of sexual misdemeanour.

With regard to the symptoms themselves the following points are important: (i) Discrepancy of subjective symptoms with conduct; (ii) variations of symptoms with unawareness of observation; (iii) variations in accordance with self interest; (iv) as time goes on intensification of those signs of emotion produced by voluntary muscles but disappearance of those impossible of imitation.

Specially suspicious points are profusion and alleged intensity of subjective symptoms with absence of those signs of emotion which are innervated by the autonomic nervous system.

I should be less certain than formerly that none of the autonomic changes of fear are capable of reproduction by will; I have of late years on occasion, just before a Pension Board, so often seen a great increase of symptoms in a patient whose interest was served by such increase. But at least the following can be taken as usually denoting a genuine anxiety state that is out of the patient's control: tachycardia, arrhythmia, D.A.H., a blood-pressure which is raised constantly or rises excessively during examination, vasomotor changes such as sweating and flushing, enlargement of thyroid, polyuria, diarrhoea, insomnia and evidence of nightmares. All the last three need to be confirmed by observation.

There are certain other physical signs of emotion the quality of which as genuine or not can only be distinguished after much experience. These include stammer, fine tremor and increase of tendon reflexes.

Tremor is much more important in the face and tongue than in the hands, and increase of the supinator and triceps jerks more significant than exaggeration of knee jerks, but a certain quality is the real essence of the matter.

Distinction between anxiety neurosis and cowardice and the difference of action based upon it is perhaps one of expediency rather than of abstract justice. If one knew all that had gone in the way of heredity and upbringing to the making of the "coward," one might think it unjust that he was shot and the "anxiety neurotic" put in hospital. But obviously armies cannot be run without hardship to the individual. The distinction, such as it is, has to be based upon outward conduct—that is, failure to accept the risks which are up to the man in question.

The mere existence of the bodily signs of fear is no discredit. They were almost universal at times in the War and even manifestations of it in voice and gesture were common. It was only definite failure in duty that could justifiably be called cowardice and punished by way of example.

Indeed the presence of really severe bodily signs of fear should be regarded as a mitigation of such conduct and the absence of such bodily

manifestations combined with failure in duty as constituting a higher degree of guilt.

Naturally all sorts of non-medical questions such as previous conduct of the individual and expediency of making an example at a particular time or place had to be considered.

Some cases of alleged cowardice were among those which exemplified how essential it was that expert psychiatric opinion should be available for disciplinary problems occurring in divisional units.

I saw in France an unfortunate schizophrenic who had been repeatedly subjected to punishment on account of his recurrent lapses, and also what must have been one of the earliest cases of epidemic encephalitis, in whose case exemplary punishment was under consideration because he had a habit when on duty in the trenches of falling asleep with his head resting on the parapet—a perfect mark for snipers.

I want to say a word now about the military importance of anxiety neurosis. We are told that as recognized invaliding disabilities the war neuroses only formed 2 per cent of the medical casualties of the War. In reality they were vastly more. I believe that while 22,000 were invalided for these conditions several times that number were eventually dealt with by the Ministry of Pensions as suffering from recognized war neuroses. But many further cases were disguised under such diagnoses as epilepsy, D.A.H., gastritis, and so on.

In addition neurosis played an enormous part in protracting, during service and afterwards, a disability which was initially due to either gunshot wounds or gas or had resulted from many other of the medical diseases.

These neuroses will probably be even more important in another war. It seems to me to be absolutely essential that the R.A.M.C. should contain personnel trained in dealing with these conditions.

For general control of the situation, command of hospitals, convalescent units and directing the policy of Medical Boards there should be regular officers combining a sympathetic with an unsentimental attitude. One of the recommendations of the War Office Committee on Shell Shock was that special instruction should be given to R.A.M.C. officers on the psycho-neuroses and psychoses as they occur in war, and selected officers should be encouraged to specialize in the study of these. I do not know how far that has been carried out.

Training will also be needed for supplementary civilian doctors who will act as regimental medical officers, or who will have later to make individual diagnoses and carry on individual treatment.

I know little of the situation as far as the R.A.M.C. is concerned, but I am perfectly sure that the training of suitable civilian help is quite inadequate.

I believe that serious attention should be given to the possibility of reliable methods of distinguishing the recruits who will develop into the

sort of soldiers that demoralize units, overload communications and occupy the beds of hospitals and the time of hospital personnel. This is a difficult problem but in view of its size one cannot feel that the proper attitude is to give it up as insoluble.

The necessary tests may need to be physical tests of the efficiency of the autonomic system rather than mental tests. The experience of the Air Force points that way. There should perhaps be also considered the possibility of further methods of so training soldiers as to reduce their liability to neuroses.

The occurrence and spread of anxiety states among the troops actively exposed to danger is partly the business of the combatant officer, but most largely of the regimental medical officer and the training of these is of the utmost importance.

TREATMENT.

Exact diagnosis is, of course, necessary of anxiety neurosis from other functional conditions and also from the various organic ones which I have already mentioned.

Most essential is the distinction how far a given case is true anxiety neurosis or hysterical : this is needed as a preliminary to all treatment. Treatment should begin at once because the patients with neuroses become far more difficult if they are allowed to get demoralized or if they get the feeling that no one expects anything of them and nobody cares what happens to them.

As already indicated, the proportion of sympathy to discipline varies according to the proportion of anxiety to hysteria in the particular case. In cases which are mainly anxiety, the first requirement in the acute stage is complete rest. This often needs combination with bromide in moderate doses and hypnotics if the patient is sleepless. Active mental treatment of any kind is usually not advisable at that stage. Later the patient requires occupation, suitable recreation in moderation, but no petting.

He needs reassurance, especially about the idea that he is going mad. But he does not need glorification as a hero and he requires to have it emphasized that having broken down and even being unfit for duties in the fighting line is no claim to exemption from further service. There should be no discharge in war for neuroses, but the patient is entitled to expert judgment by a trained Board as to fitness for particular duties.

The problem of dealing with war neurotics after discharge either by pension or treatment or by provision of employment is not directly one for the Army, but it is one which should not be lost sight of during the neurotic's Army hospital career. After all, it is apt to be an enormous national problem and upon the way the war neurotic is handled before he leaves the Army largely depends whether his life afterwards will be a burden to the country, to his family and to himself.

Editorial.

ENDEMIC GOITRE.

A STUDY of endemic goitre in two districts in England has just been made by the Committee upon Iodine Deficiency and Thyroid Disease jointly appointed by the Medical Research Council and the Agricultural Research Council.

The inquiry was designed to provide more definite information concerning the supposed relationship of environmental deficiency of iodine to the occurrence of thyroid disease than could be derived from the previous studies of the problem in this country.

Two such studies by Sir John Orr and his collaborators have already been published by the Medical Research Council.

The first report by Orr and Leitch was originally undertaken with special reference to the expanding work of the Rowett Research Institute, Aberdeen. It gave a critical survey of the subject up to the year 1928. It dealt with the distribution of iodine in Nature : in soils, water, air ; in animal tissues ; the effects of iodine on plant-metabolism ; the nature and distribution of goitre and the use of iodine in its prevention and treatment.

In an appendix to the report it is stated that only two methods of estimating iodine in biological work are of value—Kendall's and that of v. Fellenberg. The latter is considered the most delicate and most useful for all estimations of small quantities of iodine. The lower limit of detectable iodine by this method is stated to be about 0.08γ ($\gamma = 0.001 \text{ mg.}$).

The second Report by Dr. J. B. Orr, published in 1930, is on iodine supply and the incidence of endemic goitre. In this report he states that while investigations in America, Switzerland and New Zealand indicate that there is a correlation between the level of iodine intake and the prevalence of goitre, no systematic investigations had been made in England comparable to those carried out in those countries. He carried out analyses of drinking water, but could find no correlation between the level of iodine in drinking water and the prevalence of goitre in England. But as iodine ingested in drinking water forms only about 5 to 15 per cent of the total iodine intake he proceeded to make analyses of food stuffs. Samples of food were taken from areas where goitre was reported to be prevalent and these were compared with samples from areas where goitre occurred infrequently or was absent. Samples were obtained from Somerset and Cornwall, where the incidence of goitre is high, and from Essex, where it is low. In addition, counties were chosen in which the medical officers were especially interested in the goitre problem. During the collection of samples the impression was formed that none of the areas was free from goitre ; it was therefore determined to take samples from counties in the North-East of Scotland where goitre is not endemic,

and for comparison with these and English samples from an area in Scotland where goitre was known to be endemic—Dumfries was chosen for this purpose.

The following samples were taken in each area: (1) Soils from representative farms; (2) pastures from the same fields; (3) milk from the cows grazing on the pastures sampled; (4) eggs where possible from the same farms; (5) potatoes and cabbages. Difficulties in procuring guaranteed local samples were greater than was anticipated. A total of 458 substances, including 373 foodstuffs, was analysed. Soils were not analysed owing to the impossibility of making the analyses in the time at Orr's disposal.

The results on the whole were considered to be inconclusive: all that could be said is that the iodine supply as judged from the analyses of milk, eggs and cabbage is higher in the Scottish area, which is known to be goitre free, than in the English counties, where goitre is to a greater or less extent endemic. On the other hand, there is no indication of a definite difference between those areas in England which were reported to have a low goitre incidence and those reported to have a high goitre incidence.

In the appendix to the report there is a further note on the method of analysis. The quantitative estimation of minute amounts of iodine in organic substances is stated to be difficult and even with the best methods there is likely to be a wide margin of error. By the method employed complete recovery of known added quantities of iodine was not obtained; but the results obtained by any one worker were considered to be comparable.

The Committee upon Iodine Deficiency and Thyroid Disease considered that the methods employed in these earlier researches were not entirely above suspicion and any further work would be greatly enhanced in value if its analytical basis could be securely established. With this end in view a special committee of chemists was therefore entrusted by the Medical Research Council with the task of evolving an adequate method for the determination of iodine in biological materials. The Council were fortunate in securing the co-operation of the Government Chemist, Sir Robert Robertson, F.R.S., with whom it was arranged that Mr. C. O. Harvey of his staff should undertake the actual investigation. Mr. Harvey was successful in devising an improved and standardized method—based on Mr. W. H. Hurtlings' modification of Professor Th. von Fellenberg's procedure—for determining small quantities of iodine in biological substances such as blood, milk, and vegetable foods. This method was used by Miss Crabtree and Miss Mason when making their analyses of water, milk and pasture samples for the present investigation.

It has been known for many years that the incidence of thyroid enlargement is relatively high in certain parts of the West of England and very low in the Eastern counties. The Board of Education Survey in 1924 contained

evidence of a high incidence of goitre in Somerset and showed the lowest recorded incidence to be in Norfolk and Essex. It was thought that an inquiry in these districts might provide more definite information concerning the supposed relationship of environmental deficiency of iodine to thyroid disease than could be derived from previous studies of the problem in this country.

The general plan of the investigation consisted in the selection of two districts which were known to exhibit marked differences in the frequency of the occurrence of goitre; in these districts careful assessment of the actual incidence of thyroid disease in certain age-groups of children was made and at the same time the local supplies of water and milk were analysed for their iodine content. Also a study was made of the iodine content of the pastures on which the milch cows grazed.

The general conditions of life of the population had to be considered. The efficiency with which food is now distributed might make local environmental factors of less importance than in former times. To avoid these sources of error the investigation was confined to rural districts in which it was thought that the population might subsist on local sources of food. Economic conditions in the districts actually studied were such that it was unlikely that the elementary school children observed would benefit from extraneous sources of food. It was hoped, therefore, that the children observed in the rural portions of Somerset and Suffolk would yield a true impression of the reaction of the thyroid gland to the local conditions.

A medical survey of the incidence of goitre in Somerset and Suffolk was carried out by Dr. Matthew Young. For reasons already given certain rural areas were selected. In Somerset the schools visited were in three districts, referred to as the Taunton, the Yeovil, and the Wells areas. Here the incidence of goitre was found to be heaviest when the 1924 survey was made.

Rural schools in which the average attendance varied from about 40 to 150 children were inspected, as it was thought that schools of such a size would be found in villages in which one or two farmers provided the milk supply. The survey was confined to girls, since endemic goitre is three or four times more prevalent in girls than in boys. Girls from 6 years of age upwards were examined and in all cases an effort was made by gentle palpation with the forefinger and thumb of the left hand and a pair of graduated calipers in the right hand to obtain an approximate measure of the greatest transverse breadth of the gland.

Inspections were made and data collected in 120 rural schools, and of 3,801 girls from 6 to 14 years of age 1,356, 35·7 per cent, were found to have the thyroid visibly enlarged.

These figures do not represent the incidence of endemic goitre amongst girls in Somerset as a whole. The survey only included the three areas in which, as shown in Dr. Savage's report for 1924, the incidence of goitre was known to be high.

From the 120 schools from which particulars were available, 12 in which the incidence of goitre appeared to be about the highest and in which the bulk of the milk was supplied by not more than two farmers, were selected for special investigation. In girls of 6 to 8 years, 38 per cent had enlarged thyroid; from 9 to 11 years of age, 61 per cent had thyroid enlargement; from 12 to 14 years, 70 per cent had thyroid enlargement. From 6 to 14 the percentage of girls with thyroid enlargement worked out at 54. The examiners noted that two or even three members of the same family were affected. Observations made at Taunton on a market day suggested that at least 1 in 4 of the market women from the surrounding country had thyroid enlargement and in a great proportion of these women the enlargement was considerable.

An examination of school girls in Suffolk gave very different results. A similar procedure was carried out: 24 schools were examined and 12 of these selected for further study. Girls from 6 to 8 years showed 1·4 per cent enlarged thyroid; girls from 9 to 11 years showed 3·6 per cent; and girls 12 to 14 years 6·9 per cent. From 6 to 14 the percentage worked out at 3·7.

Miss Mason and Miss Crabtree analysed samples of milk, pasture and water for the presence of iodine, employing as already stated the method devised by Harvey. In the case of milk, 150 ml. samples were taken from the mixed product of the last milking. Samples of pasture of the same size were collected from each field where the cows grazed, mixed together, and a 2-lb. sample of mixed grass packed in a cardboard box. As far as possible only those grasses which the cows eat were picked. The water was taken from the household drinking supply of each farm.

The analysis of pasture and milk presented no difficulties. Many of the water samples, however, were very troublesome. All the Suffolk waters contained large quantities of salts, which in many cases caused interference with the analysis. The difficulties appeared to be due to nitrites formed during the process of the analyses.

The results were as follows:—

SOMERSET.		
	Milk γ /100 ml.	Pasture γ /100 grams
Mean	0·83	28

Water γ /1,000 ml.
6

Excluding three aberrant results the mean of the water 2·9.

SUFFOLK.		
	Milk γ /100 ml.	Pasture γ /100 grams
Mean	0·76	25

Water γ /1,000 ml.
10·6

Excluding one aberrant result the mean of the water 8·2.

The only significant difference to be observed between the two districts lies in the iodine content of the waters. The results of the analysis of milk and pasture are practically identical for the two districts within the limits of error of the method. In so far as pastures are concerned this is

considered to indicate that the Somerset soil must contain a sufficiency of available iodine in spite of the deficiency of iodine in the water supply. The identity of the iodine contents of the milk supply is doubtless a reflection of that of the pastures.

The influence of diet on the iodine content of milk was shown by the higher figures obtained for the winter samples when the cows were receiving supplementary feeds rich in iodine.

For the maintenance of a high concentration of iodine in the milk it is considered important that the pasture should contain an adequate amount of the element in an available form, and that failing this the iodine intake should be supplemented by the use of suitable salt-licks or by other means.

It is difficult to compare the results of this investigation with those obtained in other countries owing to the difference in conditions; the environmental iodine deficiency studied by von Fellenberg in Switzerland is much greater than any found in this country.

McClendon made some observations on thyroid enlargement among recruits drafted from all parts of the United States during the Great War. He found the highest incidence of goitre among recruits in areas in which the iodine contents of representative river waters varied from 0 to 0.5 γ litre. In a group free from goitre the iodine content of representative water was 3 γ litre upwards. The actual figures for the incidence of thyroid enlargement given by McClendon are much lower than those obtained in this report: this difference is due to the different sections of the population examined. The young male adults examined by McClendon would probably show thyroid enlargement at its lowest, while the girls examined by Mr. Young would show it at its highest.

The daily requirement of iodine by a child is believed to be between 25 γ and 50 γ . The authors of the report therefore think that while it is doubtless true that insufficient intake of iodine is partly and perhaps largely responsible for the high incidence of goitre in Somerset, it is difficult to escape the conclusion that some other factor must be involved.

Work carried out in New Zealand has shown that there is not necessarily a direct relationship between the iodine content of the soil and that of the plants grown on it. The results of the analyses carried out on the pastures in Somerset and Suffolk would indicate that the absolute iodine content of soil may be less important than the mode of combination in which the element occurs, since the latter may determine its availability to the herbage and hence to the animal population. Further work on the amount and mode of combination of iodine in soils in relation to the iodine content of the herbage grown thereon is considered to be necessary before a decision can be reached. Evidence is also lacking as to the extent of soil ingestion by animals when grazing under ordinary conditions and the availability to the animal of the ingested soil iodine. In the present investigation great care was taken to exclude the possibility of contaminated pasture samples, but complete success could not be guaranteed.

Clinical and other Notes.

A CASE OF SEVERE EPISTAXIS AND RECOVERY FOLLOWING THE USE OF DABOIA VENOM AS A HÆMOSTATIC.

BY MAJOR J. W. HYATT,
Royal Army Medical Corps,
AND CAPTAIN F. E. BUCKLAND,
Royal Army Medical Corps.

A RECENT experience of the results obtained by the use of Daboia venom for the control of hæmorrhage has been sufficiently striking to justify the publication of a note on the subject with the object of drawing further attention to the value of the method.

Driver L., Royal Artillery, was first seen at an out-station on August 15, 1936, with a history of continued epistaxis for six days following a blow with a cricket ball between the eyes.

He had been treated with morphia, plugging the anterior nares with adrenalin gauze, salines, hæmostatic serum, etc.; severe hæmorrhage had recurred several times. His red cell count fell to $2\frac{1}{2}$ million.

When seen his condition was grave; he was blanched, pulse rate was 94 per minute, and no bleeding point could be seen. It was decided to move him to hospital 18 miles away. After an alarming journey during which he vomited, the epistaxis recommenced. At 8.30 p.m. the posterior nares were plugged on the left side on which side blood could be seen tracking down the nasopharynx.

Daboia venom solution was available in the Station and a solution was applied to the anterior plug about midnight. Morphia was repeated. During the night he vomited a large quantity of fluid containing blood. A clot formed in the anterior nares but evidently hæmorrhage was continuing through the nasopharynx. Next morning both the anterior and posterior nares were plugged with gauze well soaked in the venom solution. Immediately all bleeding ceased, the posterior plug having evidently enabled the solution to come in contact with the bleeding point.

His condition caused grave anxiety on this day, his pulse reaching 130 per minute with respirations down to 9 per minute; however, in 48 hours he was obviously out of danger and convalescence was rapid.

The venom preparation used was a 1:10,000 solution of daboia (*V. russellii*) venom sterilized by filtration and preserved with 50 per cent glycerine. The solution had been prepared by the Central Research Institute, Kasauli, and was put up in 2 c.c. ampoules. Each ampoule contained 0.2 mgm. of venom and as the lethal dose of daboia venom for man is estimated at 40 to 50 mgm. no toxic effect from the quantity used was to be feared. The particular preparation had been tested experimentally and been found to retain its coagulant activity for at least one year!

The present case was the first one of persistent hæmorrhage in which a practical trial of solutions preserved in this way had been made, and the result was eminently satisfactory.

We are indebted to Colonel J. Taylor, D.S.O., V.H.S., I.M.S., Director of the Central Research Institute, Kasauli, for the provision of the venom, and to Lieutenant-Colonel M. White, M.C., R.A.M.C., Officer Commanding the British Military Hospital, Kasauli, for permission to send the notes of this case for publication.

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SOBITA—BISMUTH ET SODII TARTRAS AND ITS USES.

BY LIEUTENANT-COLONEL H. HILDRETH, D.S.O., O.B.E.

Retired Pay.

If asked which was the most useful, if not the most used, drug on the Gold Coast after quinine, I should say "sobita."

The native looks upon the injection of sobita as the panacea for all his ills, and perhaps rightly so. Yaws, for which it is primarily given, is the root of many of his ailments. The insidious and obscure symptoms due to yaws yield to sobita.

The results obtained by its use in cases of ainhum and goundou are such as to suggest the probability of these two diseases being manifestations of yaws. I am indebted to Dr. W. H. Watson, M.C., M.O., Bibiani (1927), Limited, for the information.

My experience of the treatment of these diseases is limited to three of ainhum and two of goundou, but the results of the treatment have been striking.

In cases of ainhum, after the second injection of sobita the patient tells you that the burning sensation in the toe has ceased. After four injections he no longer visits you, the toe having taken on a more or less normal appearance.

In cases of goundou the results are not so immediately apparent. After the average course of about twelve injections the nose takes on a flattened appearance.

Though the symptoms of yaws are undoubtedly obscure and vague, its early manifestations, seen only occasionally in adults but generally in infants, are very definite. Such being the case, it puzzled me exceedingly why parents did not bring their infants for treatment until they were covered with sores. An intelligent farmer explained that when a child was attacked by yaws and did not succumb, it would grow up a strong adult. This may or may not be the case, but it always struck me that there was some reason for the delay in seeking treatment.

I am not prepared to say what percentage of the population is, or has been, infected with yaws, but I should put it at a fairly high figure. It is estimated to be as high as 95 per cent amongst Ashanti's and 50 per cent amongst Fanti and Dagarty tribes. The disease is contracted by the Northern Territory and Soudanese emigrants.

One is rarely fortunate enough to see the disease in its earliest stages. Personally, I have only seen three cases of commencing yaws, and these my African dispenser, with years of experience, pointed out to me. A small ulcer may or may not exist, but a granuloma of the skin is the primary evidence. The secondary symptoms, ulcers varying from the size of a threepenny piece to sixpence, and in a few cases to the size of a shilling, are more often seen in infants and children, rarely in adults, the face, buttocks, genitals and legs being the principal affected parts. Between the folds of the buttocks the ulcers take on a condylomatous appearance. In the case of the genitals of male infants the scrotum becomes enlarged and œdematous, and the penis twisted and distorted. The first injection of sobita appears to restore the condition of the genitals to a normal appearance.

In children, periostitis of the tibia and radii is seen, leading to curvature of the bones. This is followed, if not treated, by a permanent osteitis. Dactylitis is also frequently encountered in children after the initial granulomata have cleared up. It is not seen in children over about 10 years old, and responds readily to treatment (Dr. W. H. Watson). Periostitis has been noted in two women—in one the tibia was affected and in the other the humerus. Both reacted more readily to solu-salvarsan after injections with sobita.

Adults usually seek treatment for pains in the bones (the joints are rarely affected), girdle pains, yaws of the feet, nodes of the tibiæ and radii, sterility and impotence, intense itching of the whole body, and large ganglia on the wrists and back of the hands. In the case of ganglia, a couple of injections suffice to cause their disappearance.

A partial paresis in four adults, affecting the right leg, was noted—one died, two did not continue the treatment, and the fourth is gradually regaining control.

As a late symptom, a peculiar and intense inky blackness of the skin is sometimes seen. A case at present under treatment has a perioral pigmentation; leucodermal patches of the face were also noted in another case of yaws. These two conditions do not appear at present to benefit by sobita alone, and it is doubtful whether they will under any form of treatment. The early granuloma leaves dark stains on the skin, but with stovarsol plus solu-salvarsan these stains disappear (Dr. Watson).

The loss of the soft and hard palate I have only seen in two cases, and of portions of the nose in one case.

It is interesting to note that a patient suffering both from yaws and guinea-worm infection was also reported for treatment. The effect of the

first injection of sobita on the guinea-worm was extraordinary. The skin over the site took on a parchment-like appearance and feel, and the worm had evidently died. I was so encouraged by the result that the second case of guinea-worm received the same treatment with a similar result. Whether we have in sobita a cure or not, I am not yet in a position to say.

Impetigo of the scalp, whether due to yaws or not, in children yields to sobita: chronic gonorrhœa and enlarged inguinal and cervical glands are certainly benefited by it. Whether we have in sobita plus solu-salvarsan a solution of the tropical bubo has yet to be seen. I have no doubt that arsenical preparations are more rapid in their action, and one does treat obstinate cases with stovarsol as well—but for general use the price is prohibitive, though the introduction of solu-salvarsan for intramuscular injection is a great advance, for it is not so expensive as the intravenous products and appeals to the native as the “pump treatment” (injections into the buttocks). My experience with this drug is limited, but I should say a course of solu-salvarsan following on a course of sobita should be an absolute cure. Relapses, however, are not unknown after a sobita course. I have only met with about six cases coming up the following year for another course, out of about 1,000 cases treated annually. I cannot say I have seen any ill effects from sobita.

Soreness of the gums, especially in children, must be looked for before injection.

In two cases an extraordinary condition of the tongue occurred. The patients appeared with their tongues swollen to about three times the normal size, projecting between the teeth with salivation. A calomel purge restored the normal condition in twenty-four hours.

Lumps at the site of the injection can, I consider, be avoided by giving the injection slowly.

Some patients complain of a burning sensation after the injection, extending down the legs. Stiffness and soreness last invariably for a couple of days. These particular effects are not so noticeable with solu-salvarsan injections.

The preparation of the solution is a simple one and the dose naturally varies: infants, 0·3 to 0·5 cubic centimetre weekly; children up to 0·8 cubic centimetre, and adults up to 1·5 cubic centimetres. I personally prefer smaller doses except when the feet are affected and the symptoms are of an urgent nature.

In cases of yaws of the feet, painting with a 20 per cent solution of silver nitrate (AgNO_3) is beneficial and definitely eases the pain (Dr. Watson).

The course is always begun with a saline purge, and unless the patient has a temperature, or sore gums are present, there is no objection to the weekly treatment.

FORMULA—

B.S.T. (SOBITA).

R	Bismuth sodii tart. ..	..	..	10 drachms
	Glucose powder ..	..	..	7½ drachms
	Acid carbolic pur. ..	..	..	45 minims
	Sterile distilled water ..	..	..	14 ounces

2½ grains is equal to 2 cubic centimetres.

The container is always sterilized and the contents filtered.

I am indebted to Dr. W. H. Watson, M.C., whose long experience in the tropics enables him to speak with authority, for the paragraphs embodied.

This is not written as a treatise on yaws, but is a generalization of my observations, and it occurred to me that it might be of interest to officers of the Corps serving in parts of the world where the conditions mentioned occur.

My experience covers a matter of only ten months with about 1,200 cases.

TWO USEFUL OINTMENTS.

BY MAJOR F. S. GILLESPIE,

Royal Army Medical Corps.

PROMPTED by an article written by Major Atkins some months ago, suggesting that officers might pass on useful information and prescriptions through the columns of this Journal, I am entering the journalistic field with a couple of useful prescriptions.

I cannot claim originality for either of them, but they have proved so useful to me and a few friends to whom I have passed them on, that I think others might be glad to give them a trial.

The first was given to me by Lieut.-Colonel A. M. Rose, D.S.O., R.A.M.C., in Northern Ireland, who put himself in rather a unique position by completely curing a patient who had been invalided for an intractable eczema and was being kept in hospital as a free patient until he should be fit to go home.

The ointment is Lassar's Paste with the addition of three per cent of crude coal tar, which can be procured from the local gas works.

I have used this ointment for a good many skin conditions, and, while I do not claim that it is a "cure all," I consider that it is better than any single ointment in general use. I have found it most useful in cases of tinea cruris, its only disadvantage being that it soils the underclothes.

A case I had recently was that of a Naval officer friend whom I noticed with a patch of tinea when changing for tennis; he told me that he had had it for eight years and had tried numerous remedies without success. I gave him a box of the ointment and the tinea has now completely disappeared.

The ointment has also proved most useful in cases of impetigo, the routine in these cases being to remove all scabs and clean the patch thoroughly with

a lotion of 1 grain of hydrarg. perchlor. in one ounce of spirit vini rect. A coat of the ointment is applied on a piece of gauze and the whole covered with an occlusive dressing of adhesive plaster. The dressing should be changed twice daily.

The second prescription was given me by a Captain of the Indian Medical Department, who was Assistant Surgeon in Kohat in 1919, whose name I have, unfortunately, forgotten.

The ointment consists of :—

Zinc oxide	..	..	..	1 drachm
Starch	..	..	..	1 drachm
Pure carbolic acid	..	..	..	10 minims
Liq. extract of ergot	..	..	..	1 drachm
Vaseline	..	..	..	1 ounce

This ointment will often abort a boil if applied early under an occlusive plaster dressing, but its chief use is for the painful furuncles which are met with inside the nose, and in the external auditory meatus. It should be applied fairly thickly.

For boils which are too far advanced for abortive treatment I have had good results with the ether dressing described by Dr. J. J. O'Keefe in the *British Medical Journal* of July 20, 1936, the great advantage of this treatment being the simplicity of application.

Echoes of the Past.

WAR EXPERIENCES OF A TERRITORIAL MEDICAL OFFICER.

BY MAJOR-GENERAL SIR RICHARD LUCE, K.C.M.G., C.B., M.B., F.R.C.S.

(Continued from p. 409, vol. lxxvii.)

CHAPTER XVII.—THE CAPTURE OF BEERSHEBA.

THE time fixed for the commencement of the operation, which was kept carefully secret till the last moment, was at dawn on October 31.

The plan of action to be carried out by the 20th Corps consisted of two parts, as follows : First, the capture of Beersheba. Secondly, an attack on the strong Turkish positions at Kauwukah and Sheria. When these latter were taken the Turkish line of defence would be turned and the Turkish line of communication with Gaza threatened.

The assault was to be made by two divisions, the 60th on the right and the 74th on the left. The 53rd Division was to cover their left flank by holding the high ground facing the Turkish positions to the West of Beersheba. The 10th Division was in corps reserve behind the left flank of the 53rd Division.

The Anzac and Australian Divisions of the Desert Mounted Corps were

to make a wide detour eastwards and, passing round east of the town to deliver an attack from the north-east simultaneously with our own.

The Imperial Camel Corps filled the gap between the 53rd and 74th Divisions. The Yeomanry Division was in Army reserve covering the interval between the 20th and 21st Corps. The 53rd Division moved out to its position the day before to cover the approach march of the 60th and 74th Divisions.

In the scheme of medical arrangements the Desert Corps were to be accompanied by their own motor ambulances and, unless the attack was a failure, were not to attempt to send their wounded back by the same route they used in coming, but were to retain them until Beersheba fell and then evacuate them through the town.

On October 27, in preparation for the operation, the administrative part of 20th Corps Headquarters moved forward to Shellal and camped in the bed of the Wadi close to the pumping station. A first taste of the wet season came that night in the form of a heavy thunderstorm. Fortunately it did not affect the stream of the Wadi Ghuzzeh.

October 30 was a busy day at Shellal. Troops were pouring continuously across by the various roads that had been prepared for them. All day and all night the long strings of camels of the Water Convoy filed backwards and forwards to the filling points. The railway was kept busy carrying supplies to the new depot which was being formed at Imara.

In the afternoon we moved our administrative headquarters three miles out on the Beersheba road and General Chetwode took up his fighting headquarters some seven miles from Beersheba.

The morning of the great day, October 31, so anxiously expected for more than six months, came at last—the day on which we were to blot out the memories of the former Gaza failures.

To the administrative staff of a big formation like a corps, the early hours of an operation are a period of curious inaction. All one's plans are completed and the finishing touches have been put to the arrangements. It only remains to wait patiently to see how they work out. It is some considerable time before new or unforeseen circumstances can arise and the interval produces a sort of blank feeling, full of tense anxiety, which cannot be relieved by action.

News came in from the front from time to time.

The first objective, a hill in front of the 60th Division known as 1070, was taken by 8 a.m. The main attack followed and after severe fighting all the defences of the town were in our possession by evening and the Turks in full retreat to the north-west.

The Desert Corps troops were a little late in getting to their position, and met with considerable opposition especially at a strongly held isolated hill near the Wadi to the north of the town known as Tel el Saba.

The motor ambulances at my disposal, which now included part of the 35th Motor Ambulance Convoy usually under direct control of the D.M.S.,

were dispatched to their rendezvous in the early hours of the morning, the D.A.D.M.S. of the Corps, Major Lelean, being responsible for their distribution. Casualties did not begin to reach the casualty clearing station until 1.30. p.m. A corps Bureau had been established at the entrance to the casualty clearing stations where record of all casualties arriving was registered so that we knew exactly what was going on as regards evacuation from hour to hour.

The first batch consisted of eighty sitting cases from the 74th Division. The 10th Division motor ambulances which had been held in reserve were distributed to the 60th and 74th Divisions in the course of the day. By 10 p.m. about 900 casualties were reported as having reached the casualty clearing stations.

After the engagement was over the 60th Division bivouacked south of the town and the 74th inside the lines of defence between the Wadi Saba and the main road into Beersheba.

On the following morning the Desert Corps entered and took possession of the town.

In their retreat the Turks had managed to withdraw all rolling stock from the town except four trucks and one passenger coach. These were found standing in the station each containing a charge of dynamite wired ready for explosion. The Turk to whom was entrusted the duty of firing the charge was caught in the act of carrying it out and dispatched before he could accomplish his purpose. They had also managed to blow up a bridge about three miles out so that the railway was of little use to us in the subsequent operations.

The Desert Corps was charged with the duty of taking over the town so that to the D.D.M.S. of that Corps, Colonel Downes, fell the responsibility of the Turkish hospitals. These were found to contain about two hundred wounded and two hundred sick. Some of the latter were convalescent from typhus, but none were in the infectious stage.

Five or six medical officers were captured, mostly Syrian Christians. Some of these made themselves useful in looking after the Turkish patients. Two places had been in use as hospitals, both good modern buildings, one a civilian hospital, the other a town hall. The first of these was allotted to 20th Corps and the latter to the Desert Corps.

Arrangements were at once made to send up the Immobile Section Groups of the 60th and 74th Divisions from Imara, to take charge of our hospital.

At the same time the 60th Division sanitary section was sent up to take charge of the sanitation of the town. It was in a most filthy condition. The civil inhabitants had been removed some time before, and the place had become horribly insanitary. Filth and flies were everywhere. A thorough house-to-house cleansing of the place was quickly organized; all existing privies were closed down and sealed and a regular system of bucket latrines installed in their place.

I took over responsibility for the town from D.D.M.S., Desert Corps, on the morning of November 2 and at once started the work of evacuating the sick and wounded prisoners, under instructions from the D.M.S. The main dressing stations of the 60th and 74th Divisions outside the defences were practically cleared by the evening of November 1.

Twentieth Corps Headquarters moved into Beersheba on the evening of the 2nd, and occupied the Turkish Governor's house and neighbouring buildings.

Twenty-five years before this, Beersheba was little more than a collection of mud huts. About twelve or thirteen years before the War the Turkish Government in a spasmodic fit of energy had set about developing the place as a centre of government and commerce. Some good buildings had been erected including the hospital and town hall, a post



A.D.M.S.' Office, Beersheba.

office, a governor's house, and a fairly decent hotel under German management. The streets were methodically laid out and there was even a small public garden with a fountain, and a monument erected to commemorate their victories up to date.

During the Turkish advance against the Canal in 1915, Beersheba had been an important centre for the concentration of troops. A metre-gauge railway was constructed, joining it with the Jaffa-Jerusalem line at a place known as Junction Station, about ten miles from Ramleh. The line was subsequently continued south to Auja which had been the starting point for the venture across the desert in 1915 and railhead for all the advances into Sinai during the summer of 1916.

After their defeat at Rafa in January, 1917, and the subsequent abandonment of the Shellal position referred to above, the Turks were in considerable doubt about holding Beersheba; the civil population was

withdrawn, and the town became merely a defensive position. During the summer of 1917 the rails south of Beersheba were removed and used for the construction of a new branch line to Deir Sineid, a few miles north of Gaza.

The real importance of the town now, as in the time of its first mention in history, is its water supply, which is both abundant and of good quality; unlike that found lower in the Wadi the water is quite sweet to taste. One of the wells here is doubtless the very one for which Abraham bargained with Abimelech (Gen. xxi. 31), but there is now quite a group of them and there is nothing to identify the particular one which saved the life of Ishmail nearly four thousand years ago. Some of the wells had been fitted by the Turks with gas engine pumps, others retained the older methods of raising water. Before retreating the Turks had damaged some of the pumps but by no means all, and our engineers were soon in a position to supply from them a large proportion of the big army now in and around the town.

The water supply itself seemed inexhaustible, it was merely the facilities for raising which were inadequate and this made it difficult to supply the whole body of troops and their animals.

Here, as elsewhere, every drop of water was chlorinated before being issued to the troops, a precautionary measure more to avoid contamination in the issue than because of any fear of risk at the source.

In their hasty retreat whether by carelessness or of malice prepense the Turks had left large numbers of hand grenades scattered about the town. These seemed to have an irresistible attraction for some of the Egyptian camel drivers and Labour Corps men. For the first few days of our occupation explosions were constantly taking place and resulted in a considerable number of casualties. In riding about one had to be quite careful to avoid the danger of one's horse treading on a live bomb.

In the original scheme it had been intended to enter upon the next phase of the operation the second or third day after the occupation of Beersheba, but owing to the necessity of building up a sufficient forward reserve of ammunition and supplies and to the fact that a bad *Khamsin* blew steadily for three days, the second stage could not be entered upon until six days after the town had been taken.

In the meantime the 21st Corps had captured the whole of the enemy's first line of trenches at Gaza, from Umbrella Hill on the east edge of the sand dunes, to the sea, and was inflicting heavy casualties on the garrison by a continuous bombardment of the town.

The main objective of the second part of our operation was the water supply at Sheria. This place is on the line from Beersheba to Ramleh and about fifteen miles from Beersheba. It was covered from attack from the South by a strong trench system above Kauwukah.

The defences consisted of the strongly fortified position on high ground close to the Gaza-Beersheba road looking out over the plain between it

and Shellal, and a series of interrupted trenches extending for about a mile and a half on the east side of the railway in continuation of the Kauwukah lines.

In the interval, between the capture of Beersheba and the attack on Kauwukah eventually fixed for November 6, the movements of the various Divisions of the Corps had been as follows:—

The 53rd, on November 1, moved forward to the hills to the East of the Beersheba-Hebron road where they came into touch with the enemy in force and had some severe fighting near Koleh to maintain their position. In this they were assisted by a part of the Desert Mounted Corps who held the Hebron Road.

The 74th moved to a position near Kuweilfeh to the North of the town, where they, too, came into touch with the enemy.

The 60th remained concentrated about two miles North of the town.

The 10th, after the move forward of the 53rd, had taken up a line across the Gaza-Beersheba Road with its right in touch with the 74th and its centre about Irgeig.

The week was a busy one medically. The sick rate was high and the casualties from the 53rd Division, both sick and wounded, were heavy. The route of evacuation from this Division was a bad one. The tracks to Koleh were over loose ground and soon became impassable for motor ambulances. Meanwhile the road from Beersheba to Imara was daily getting worse, though fortunately it never had to be quite abandoned for motor traffic.

The Immobile Sections of the 60th and 74th Division field ambulances arrived at Beersheba on November 2 and took over the Turkish civil hospital as arranged, setting free the other sections of the field ambulances to move forward with their divisions. This hospital received all the 20th Corps casualties and passed them on to the casualty clearing stations at Imara.

For the evacuation at this period, as the motor ambulances were only able to make one journey to Imara and back in the day, it was necessary to make use of motor lorries and even of horse-drawn supply wagons returning empty to the railhead depot. Both the Artillery and the Army Service Corps were called in to help in this matter. For walking cases it proved fairly satisfactory, but an attempt to take stretcher cases slung in the lorries by an improvised method was not a success and had to be abandoned. The columns were too long on the road and the collection and loading of the patients delayed them.

As the supply and ammunition depots had been moved by this time a few miles further forward with the railhead to Karm, it was necessary to transfer patients going by these convoys to train at this point. A detachment of the 10th Division Immobile section was stationed at Karm to feed the convoys and to superintend their transference. For slightly wounded cases the arrangement worked well enough, but the lying down cases arrived cold and exhausted.

On November 4, the 53rd Division was involved in heavy fighting at Kuweilfeh, a high hill on the lower slopes of the Judean range looking out over the plain towards the sea. The Turks, after their withdrawal from Beersheba, had not gone far. They made a big effort to prevent our pushing on by a concentration on these hills, thus threatening our right flank.

The 53rd Division nobly bore the brunt of this counter-attack, and by their stiff resistance and subsequent successful forward movement, enabled the Corps Commander to carry on his preparations for the second stage of the operation without diverting any of the other divisions from the rôles which had been allotted to them.

The hill of Kuweilfeh itself dominated an important group of wells and the effort of the 53rd culminated in a stiff fight for this hill. The battle ebbed and flowed on the crest several times.

When I visited the hill a few days later, the lines of shelter trenches often back to back and the surface of the hill sprinkled with the cartridges of two different pattern rifles, showed clearly how the fortune of war had varied, first one side gaining ground and then the other, during the struggle.

Eventually the hill remained safely in our hands and the commencement of the forward movement of the other divisions relieved the pressure on the 53rd Division who had suffered heavy casualties.

(To be continued.)

Current Literature.

WALLACE, H. L., and SMITH, A. B. **The Effect of Early Tonsillectomy on the Incidence of Acute Rheumatism.** *Edinburgh M. J.* 1936, v. 43, 452-57.

The authors have initiated an investigation into the effect of early tonsillectomy on the subsequent incidence of acute rheumatic infection. The relationship between the faucial tonsils and rheumatic fever has been the subject of much discussion and controversy, since some observers believe them to be the principal source of infection in such cases, and go so far as to regard tonsillitis and recurrent sore throats as actual manifestations of the rheumatic process.

For the purpose of this investigation the authors secured the names of all children subjected to tonsillectomy before the age of 5 years in three hospitals who had no evidence of rheumatic infection. These children, who numbered 403, were carefully followed up and visited. A further series of 574 children, who had been operated upon at a later age, were similarly investigated.

They found that removal of the tonsils in early life failed to prevent the

subsequent occurrence of the signs of acute rheumatism as compared with the other series. Of the former group, 7.2 per cent developed rheumatism before they left school; of the latter group, 4.2 per cent only developed rheumatism during the same period. The criteria of acute rheumatism for the purposes of this investigation were confined to rheumatic fever, chorea and carditis. It would seem from these results that the group of children tonsillectomized before the age of 5 were actually more liable to subsequent rheumatic manifestations. It was found in addition that all forms occurred equally in this group, chorea not being especially prominent as appeared from the somewhat similar investigation carried out by the Medical Research Council in 1927.

The incidence of scarlet fever was also recorded in both groups in view of its affinity with rheumatism. In the case of this disease the incidence did not vary in the two groups.

W. S. C. COPEMAN.

Reprinted from "Bulletin of Hygiene," Vol. 11, No. 10.

PREUSS, H. Eine neue säureanzeigende Reaktion auf Dextrose-Aszitesagar zur Unterscheidung von Diphtherie- und Pseudo-diphtheriebazillen. (Mit Berücksichtigung der Typendifferenzierung des Diphtheriebazillus.) [**The Differentiation of the Diphtheria Bacillus from Diphtheroids by a New Fermentation Reaction on Dextrose-Ascites Agar.**] *Zent. f. Bakt. I. Abt.* Orig. 1936, v. 137, 105-12. [38 refs.]

True diphtheria bacilli grown on $\frac{1}{2}$ per cent, dextrose-ascites agar produce in twenty-four hours a cloudiness around the colony. On this medium 301 strains of *C. diphtheriæ* and 199 pseudo-diphtheria strains were examined; of the true *C. diphtheriæ* strains 98.3 per cent caused cloudiness while of the pseudo-diphtheria strains 99 per cent left the medium unaltered. The clouding is apparently due to precipitation of protein by the acid produced. The medium also gives good differentiations between the *gravis*, *mitis* and "intermediate" forms of the diphtheria bacillus.

In Düsseldorf *gravis* is the most uncommon type accounting for only 23.7 per cent of cultures, 35.6 per cent of cultures were of the *mitis* and 37.3 per cent of the "intermediate" type. The "intermediate" type appears to be associated with the most severe disease. 55 per cent of carriers were infected with the *mitis* type. In one institution twenty-three cases of diphtheria occurred among the children and all were of the *mitis* type. Four *gravis* infections were found among fifteen carriers, and it is of interest to note that none of them had a history of diphtheria while all of them had recently been through an attack of scarlet fever.

C. C. OKELL.

Reprinted from "Bulletin of Hygiene," Vol. 11, No. 11.

PERRY, C. A., WHITLEY, OMA R. & PETRAN, Elizabeth. **Types of *C. diphtheriae* in Maryland. Cultural Reactions, Cellular Morphology, Virulence, Distribution, Stability and Clinical Significance.**

Amer. J. Hyg. 1936, v. 23, 580-99, 1 pl. & 2 charts. [12 refs.]

The distribution of *gravis*, *mitis* and "intermediate" types was studied in Maryland (U.S.A.). All the strains of *C. Diphtheriae* isolated fermented glucose and dextrin but not sucrose. Of fifty strains classified as *gravis* 66 per cent fermented glycogen and starch, 16 per cent fermented starch but not glycogen, while 18 per cent fermented neither. None of the strains classified as *mitis* or "intermediate" fermented glycogen or starch except three *mitis* strains which gave feeble reactions in starch. The type of growth in broth was not found constant for any of the three types.

The cellular morphology of the three types was found to be very characteristic particularly if grown on Douglas's tellurite medium. The *gravis* type on this medium is very short, the staining is comparatively uniform and short snowshoe-shaped forms are very characteristic. The *mitis* form appears as a slender fusiform rod usually with few if any barred forms and with many forms showing metachromatic granules. The "intermediate" form is characteristically barred. With practice cultures can be typed on cellular morphology alone.

Only about 3 per cent of the cultures as a whole were avirulent by intradermic tests in guinea-pigs. As judged by the diameter and intensity of the intradermic reactions the virulence of the *gravis* type was greater than that of the *mitis* type, which was in its turn greater than that of the "intermediate" type. During the years 1934-35 all the types were found in the twenty-three counties of Maryland.

Epidemics involving considerable numbers of cases and carriers occurred with both the *mitis* and "intermediate" types but only small epidemics and scattered cases were due to the *gravis* type. No evidence was obtained of a correlation of type with clinical severity.

In no instance was a change of type noted in any case or carrier when subject to repeated examination. For practical purposes the types may be considered as stable.

C. C. OKELL.

Reprinted from "Bulletin of Hygiene," Vol. 11, No. 11.

Reviews.

A SHORT PRACTICE OF SURGERY. Third Edition. By Hamilton Bailey, F.R.C.S.Eng., and R. J. McNeill Love, M.S.Lond., F.R.C.S.Eng. London: H. K. Lewis and Co., Ltd. 1936. Pp. viii + 996. Price 28s. net.

The very fact that the third edition is necessary within a year of the previous one proves the popularity of this work.

It is difficult to criticize such an excellent book; but in view of the

importance of fractures, we should have expected to find more detail given in respect of certain fractures. On the other hand a detailed description of a Thomas' knee splint seems unnecessary in this type of manual.

A few other points of a similar and unimportant nature could be commented on, but what should be included and what omitted is a matter of opinion, and is not altogether an easy problem to solve.

The paper and printing are excellent. The illustrations are profuse, and most helpful in understanding the subject.

As a standard up-to-date work on general surgery, this book is strongly recommended both for students and practitioners alike.

A HANDBOOK OF TROPICAL THERAPEUTICS. By Brevet Colonel R. N. Chopra, C.I.E., K.H.P., M.A., M.D.Cantab., M.R.C.P.Lond. Calcutta: Art Press. 1936. Pp. xxi + 1748. Price Rs. 25.

Colonel Chopra's "Handbook of Tropical Therapeutics" extends over 1,700 pages. Its scope ranges far beyond what the title of the volume would imply; many other aspects of disease, tropical and otherwise, being dealt with.

The first part of the book deals with general consideration in therapeutics, including the action of drugs, conditions modifying their action and their modes of administration. A chapter in this part is devoted to diet and dietetics in the tropics. Here the whole question of food value and deficiencies of essential ingredients of diet likely to occur in the diets of local inhabitants and others is discussed in detail.

In Part II remedies used against helminthic diseases are considered. It begins with a general consideration of the problem, sites of the helminth, choice of anthelmintics and methods of administration. Succeeding chapters deal separately with anthelmintics against cestodes, nematodes, while other miscellaneous anthelmintics are mentioned. Part III deals with remedies used against protozoal diseases. The treatment of amœbiasis is considered very fully. Here the author stresses the point that emetin is not such a satisfactory drug in the treatment of the subacute and chronic type of the disease as in acute amœbic dysentery. In amœbic hepatitis he points out the importance of realizing that previous dysenteric symptoms may have been entirely absent in a patient suffering from this most important amœbic complication. The more recent remedies in the treatment of amœbiasis are very fully discussed.

Treatment of malaria is of special interest at the present time and this subject is very fully considered in a special section. The relative value of quinine, plasmoquin and atabrin are discussed.

Part IV deals with remedies used against bacteria and virus diseases. The chapter on virus diseases discusses the possibility of protection against the various forms of typhus by vaccines and other methods.

In Part V miscellaneous tropical conditions are considered, including

nutritional diseases, tropical neurasthenia, diseases the result of poisonous animals and drug addiction.

In the final part of the book diseases of the skin are considered.

It will be seen from this short summary that the "Handbook of Tropical Therapeutics" has been arranged in a very handy and systematic manner.

The book covers a very wide range of subjects, apart from the therapeutic aspect of tropical diseases which is dealt with in a very full and lucid manner. It should prove of the very greatest value to those practising medicine in the tropics and subtropics.

A. G. B.

HINTS TO PROBATIONER NURSES IN MENTAL HOSPITALS. By Richard Eager, O.B.E., M.D. London: H. K. Lewis & Co., Ltd. 1936. Pp. xiii + 222. Price 8s. 6d. net.

The third edition of this book is primarily addressed to Probationer Nurses in Mental Hospitals; but it has a far wider appeal.

After a very excellent set of rules for mental nurses, and a full description of ward duties, it gives a clear and succinct account of the present conceptions of psychology. Though necessarily compressed, this section gives a well-thought-out résumé of this science. It can be cordially recommended to those who desire to acquaint themselves with the elements of psychology, to which it forms an admirable introduction.

A further section on the analysis of dreams follows, which too is a clear description on the mechanism and interpretation of dreams.

The second part of the book deals with the various mental disorders, their classification and causation, with sections on the alcoholic and epileptic psychoses, and encephalitis lethargica, concluding with directions as to admission and discharge of mental patients.

Although concise, the book is well written and easy to read, and gives to mental nurses a very thorough insight into their duties, and what is also important, a description of the normal mind as a foundation on which to build study of the abnormal.

The book is well produced and clearly printed and the text is illustrated with photographs of typical mental cases and some diagrams which help to elucidate difficult points.

An exhaustive bibliography and a good index complete the book.

It is interesting to note that Major Eager was at one time on the staff of the Red Cross (Maghull) Neurological Hospital, and that he is carrying on the tradition of the brilliant band of psychologists who staffed this war-time institution.

T. B. N.

Notices.

THE PARKES MEMORIAL PRIZE, 1936.

MAJOR E. F. W. MACKENZIE, O.B.E., M.C., R.A.M.C., has been awarded the Parkes Memorial Prize for his investigations into the ammonia-chlorine process of water purification in the field, coupled with research carried out by him in connexion with food supplies in India. By this work Major Mackenzie has achieved much in the advancement of Military Hygiene.

The Parkes Memorial Prize is awarded annually to the officer who is considered by the Committee to have done most to promote the advancement of Naval or Military Hygiene by professional work of outstanding merit, and is open to Medical Officers of the Royal Navy, Army, and Indian Army with the exception of the Professors and Assistant Professors of the Royal Naval Medical College, Greenwich, and of the Royal Army Medical College, London, during their term of office.

THE NINTH INTERNATIONAL CONGRESS OF MILITARY MEDICINE AND PHARMACY.

THE Ninth International Congress of Military Medicine and Pharmacy will be held at Bucarest from June 2 to 10, 1937, under the patronage of His Majesty King Carol II.

The scientific programme is as follows :—

(1) The Organization and Functioning of the Medical Services in Combined Operations of the Army and Navy.

(2) The Transport, Hospitalization and Treatment of the Gassed Wounded.

(3) The Organization and Functioning of the Surgical Service for Troops carried by Motor Transport.

(4) The Use of Colorimetric Methods in Laboratory Analysis.

(5) Men with Insufficient Teeth in Armies. Definition, Treatment and Supply of Dentures, Employment in Peace and War.

(6) A Comparative Study of the Supply of Food and Feeding of the Sick and Wounded in Peace and War.

The Secretary-General is M. Popesen Buzen, Military Sanitary Institute, Bucarest.

THE TWENTY-SEVENTH HOSPITALS, NURSING, MIDWIFERY AND PUBLIC HEALTH EXHIBITION AND CONFERENCE, NEW HORTICULTURAL HALL, WESTMINSTER.

MARCH 1 TO 5, 1937.

IN connexion with the above the first Meeting of the Committee appointed to organize an Anti-Gas and Air Raid Precautions Section (G. Clark Trotter, M.D., D.P.H., F.R.S.E., in the Chair) was held at 5, Devonshire Street, W. 1, on Wednesday, November 11. The Committee,

consisting of Representatives from the Home Office, Ministry of Health, Royal Institute of Public Health, Institute of Hygiene, British Red Cross Society, the St. John Ambulance Brigade, Women Public Health Officers' Association and the Royal Institute of British Architects, decided that the Section should be of an entirely uncommercial nature, with sub-sections as follows :—

- (1) Refuge Room.
- (2) Protected Shelter.
- (3) First Aid Room.
- (4) Individual Exhibit, including Poison Gases and their Antidotes.
- (5) Information Bureau.

The two architects on the Committee were instructed to prepare a plan, of the Section for the consideration of the next Committee Meeting on Wednesday, December 9, at 5.30 p.m.

The Programme of the Sessions for the Nursing and Midwifery Conference, March 1 to 5, 11.30 a.m. to 7.30 p.m. daily, is now completed and will shortly be published. The Public Health Conference for Sanitary Officers, Health Visitors, School Nurses, etc., will be under the presidency of William C. Gunn, M.D., D.P.H., Senior Assistant Medical Officer of the Corporation of Glasgow Public Health Department. Three Sessions will be held on the Tuesday, Wednesday and Thursday from 2.30 to 4.30 p.m., as follows :—

- (1) Basement Tenements as Affecting Public Health.
 - (2) The Disinfection and Disinfestation of Public Carrying Vehicles.
- Chairman : Air Commodore H. E. Whittingham, C.B.E., R.A.F.
- (3) Domestic Pests.

Tickets admitting to the Sessions will be sent free on application to any Sanitary Official, Health Visitor, School Nurse, etc. Delegates may be appointed by Councils. It is advisable that early application for tickets should be made to the Secretary, 40, Holland Park, W. 11. Reduced fares will be granted by all Railway Companies.

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EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc.

Correspondence on matters of interest to the Corps, and articles of a non-scientific character, may be accepted for publication under a nom-de-plume.

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Reprints or excerpts, additional to the above, can be furnished on payment if specially ordered at the time of submission of the article for publication.

Communications in regard to editorial business should be addressed—"The Editor, JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, War Office, Whitehall, London, S.W. 1."

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Journal of the Royal Army Medical Corps.

Original Communications.

ANTI-MALARIA DRAINAGE WORK IN THE NEW CHANGI CANTONMENT.

BY MAJOR W. J. F. CRAIG,
Royal Army Medical Corps.

(Continued from p. 26.)

SUBSOIL DRAINAGE IN THE CHANGI AREA.

History.

I have described earlier how, in 1928, two ravines and two wide mouth tidal swamps were treated in what is now North Cantonment, Changi. Construction work, recommenced about the beginning of 1934, necessitated an outward spread of our half-mile protection zones to the east, south and west, and so I drew up a programme of anti-malaria drainage schemes for the various valleys and swamps in this area. This work was carried out by Captain J. Farewell, R.E., D.C.R.E., Cantonment, Changi, who took the greatest interest in the work, in spite of the fact that he already had a very large amount of construction work on his hands.

The map shows all the area and all the anti-malaria drainage completed and proposed (fig. 5).

Our drainage schemes here differed somewhat from those on Tekong, because in nearly all cases the surface concrete channels had to be designed to take both the storm water and sullage water from the numerous barrack blocks and dwelling houses, etc., which were being built for the most part on the higher ground overlooking the valleys. In the valleys in the Changi area the plan that was followed is shown in a sketch plan on page 73 of

74 *Anti-malaria Drainage Work in new Changi Cantonment*

"Anti-malaria Drainage from the Point of View of the Health Officer" (private circulation) by Dr. J. W. Scharff, to whom I am again indebted for his courtesy in allowing this sketch to be reproduced here.

The conditions in the top left hand sketch, fig. 6, are very much those we had to deal with here. The bottom right hand sketch is very like the state of affairs in our completed systems as can be seen on the map in the cases of the Marsh Valley and the Selarang Park systems particularly.

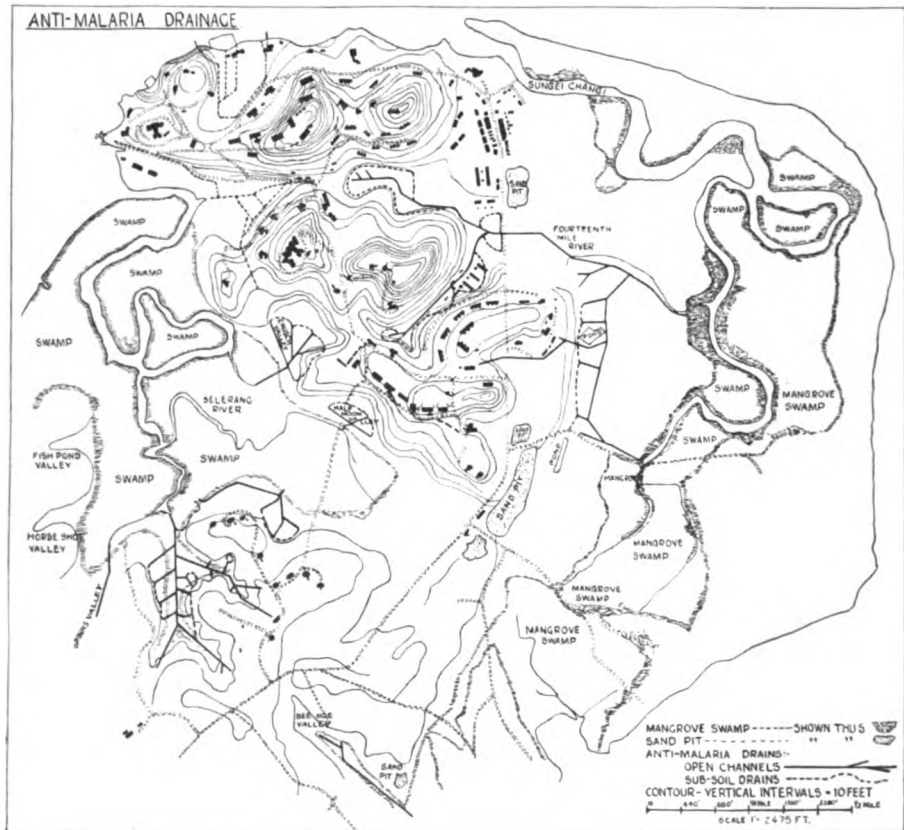
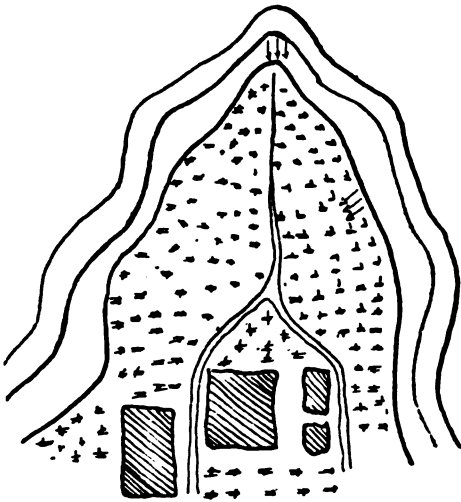


FIG. 5.

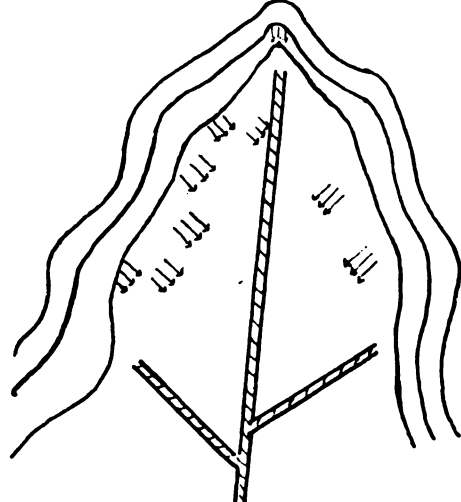
Considerable forethought is needed in designing such combined building and anti-malaria drainage systems, and in the Marsh-Chinese Valley system the buildings connected with the system have now become so numerous that the central channel is hardly adequate to carry the large amount of house sullage water, roof rain water and surface water that pours into it. A relief drainage scheme for this system is shortly to be put in.

Another difference that I could not fail to observe between the Tekong and the Changi drainage lay in the nature of the soil. In Changi,

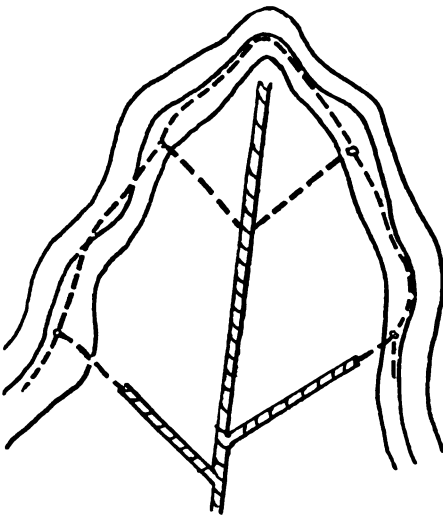
STAGES IN A SCHEME OF ANTI-MOSQUITO DRAINAGE FOR A SWAMPY RAVINE.



Ravine and swamp with pig ponds obstructing natural drainage. (Dangerous mosquitoes rarely present.)



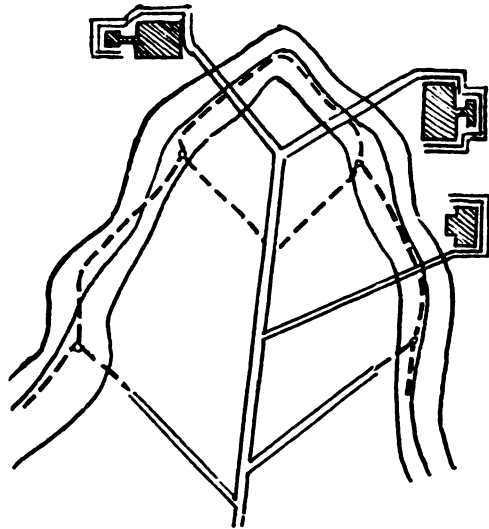
1ST STAGE.—Removal of obstruction and digging central earth drains. (Dangerous foot-hill, seepages appear.)



/// = Dangerous breeding place

-●- = Subsoil drains

2ND STAGE.—Subsoil intercepting drains constructed along hill foot. (All dangerous breeding places now eradicated.)



== = Earth drains

== = Concrete drains

3RD STAGE.—Construction of open concrete channels for domestic sullage water connections independent of subsoil drains. (Development of healthy scheme now possible.)

FIG. 6.

although before treatment the valleys were swampy enough in all conscience, yet the surface stratum of the soil was mostly sandy and looked as if it could absorb all the rain the clouds could send. Yet the completed subsoil drains on this side carried no less water than those on Tekong. Moreover, at the bottom of most of the numerous sand-pits ground water collected and remained there all the time independently of rain. On digging the trenches in this sandy soil, dry surface sand, except on the floor of the valley, extended down to about three feet or more. Beneath this stratum lay the next layer, which consisted of red laterite clay with a high water content in its upper layers, or else of white sand mixed with a pale light clay. This type of understratum also contained a great deal of water in the spaces between the soil particles, and water flowed copiously in the agricultural pipe lines the moment they were put in. It is easy to understand how in such soil, if water were allowed to enter the pipes from above, the sand carried down by it would speedily block up the drains. Strangely enough, after subsoil drains had been put in this sandy type of ground, a close growth of short and good quality grass soon appeared, while before drainage such grass, or indeed any grass, could scarcely be seen on it. This growth of grass is probably due to the removal of excess of alkalies in the soil by the constant movement of ground water, and the downward movement of the water table causing aeration of the soil. The effect of our drainage has already been shown by the growth of grass in the large new South Cantonment Padang (sports ground), and also on the India Barracks hockey ground and the Tekong Besar football ground.

The general effect of the drainage on the floor of the treated valleys is nothing short of wonderful, and I always feel that it is a pity that only a few of us, including Colonel Roberts, C.R.E., Changi, and the other Royal Engineer officers concerned with the draining of these systems, have known these swamps both before and after drainage.

The first anti-malaria drainage work carried out in Changi Cantonment after construction work started again was in the spring of 1934, when a good deal of additional subsoil drainage was carried out in the lower part of the Marsh Valley, above and below its junction with Chinese Valley. The Marsh Valley floor was becoming swampy again at this time and seepages and pools were lying constantly in the floor of the valley, and it looked as if further drainage was required. At the same time the existing subsoil lines were rodded and a number of blockages were discovered and removed. These measures completely dried the floor of the valley as far as the Changi Road.

In putting in the subsoil pipes on this occasion we did what is now our invariable rule here, that is, we had the open ends of the successive agricultural pipes placed close together with their ends touching one another, and over the top of the open joints were placed sausages, or collars, of puddled clay. The pipes were laid on a bed of rubble or broken brick or tiles, the latter for preference. The practice in 1928 was to leave a gap

of half an inch at the joints of the agricultural pipes, and to cover the upper part of the joint with broken tiles, corrugated iron or other such material. I merely mention this here because this drainage system did, in fact, become blocked in time, whereas since adopting the clay covering we have not yet been much troubled with blockages, except one very recently in Sphinx Valley, Tekong. At the same time, although I am convinced the present method is the better, it is perhaps too early to make a definite statement. The civilians, however, have adopted it.

Church Valley.

The next system to be introduced into Changi was in the valley named Church Valley on the map. This is a wide-mouthed amphitheatre shaped valley with its mouth opening on to the Selarang River mangrove swamp. On the high ground around this valley the Gun Park, five Officers' Quarters and the Royal Artillery Officers' Mess were about to be constructed. Across the mouth of the valley ran a raised railway embankment, and all the valley water drained through one culvert running under the embankment, near the southern end.

A line of hill-foot subsoil drains was put in in a semicircle near the bottom of the slopes leading down to the valley, and outlets from the ends of the semicircle led down to the culvert along the bottom of the embankment. A straight central concrete channel was made across the valley to the culvert, following roughly the course of the former stream. Two subsoil drain outlets opened into the head of this channel, and one branch concrete open channel led into the central invert channel from either side. Subsoil pipe outlets likewise led into these at their heads.

I think it might have been better to put in two shallow subsoil drains across the valley parallel to the central stream and about 100 feet apart, because although high water comes well up this system and would have travelled up these pipes, yet sufficient water would have got away every day at low tide to dry effectively the floor of the valley. As it is, the system has been fairly successful in doing this, but some surface water still tends to collect in the centre.

Before being drained this valley was very swampy, and in it were a number of wells, pig-ponds, irrigation channels and along the railway side a palm swamp. The mosquito larvæ to be found here in those days were *A. kochi*, *A. hyrcanus*, *A. vagus* and *A. karwari*.

The chief point of interest in connection with the putting in of this system was the type of pipe used. For this system a supply of porous concrete pipes was bought instead of the usual agricultural pipes of red baked clay. Such pipes admit water through their sides and on the face of it it would seem to be a sensible idea, but after a year had passed Captain Farewell had some of them dug up and they were found to be crumbling away and holes were forming on their sides. He reported adversely on them and recommended that they should not be used again.

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The Colony and Singapore Municipal Health Authorities likewise do not use these pipes. The crumbling of the pipes in the Church Valley system is doubtless due to the fact that the clay soil here has a great deal of decomposing vegetation mixed with it and so the ground water which stagnates at a high ground level owing to lack of drainage probably contains an excess of peaty acid which dissolves away the concrete of the pipes.

A little further along the railway towards the Changi Road on the left of the embankment is another semicircular valley, the mouth of which was also closed by the embankment. This valley is smaller than Church Valley and drained through a small culvert running under the railway. In the seepages in the floor of this valley *A. maculatus* larvæ used to be found breeding, and as the new Artillery Barracks were about to be built on the ridge above the valley a semicircular subsoil drain was put in round the bottom of the slope with a central open invert channel, the outlets of the subsoil pipes from each side running into this along the foot of the embankment. This system, though small, was necessary and until now has effectively served its purpose.

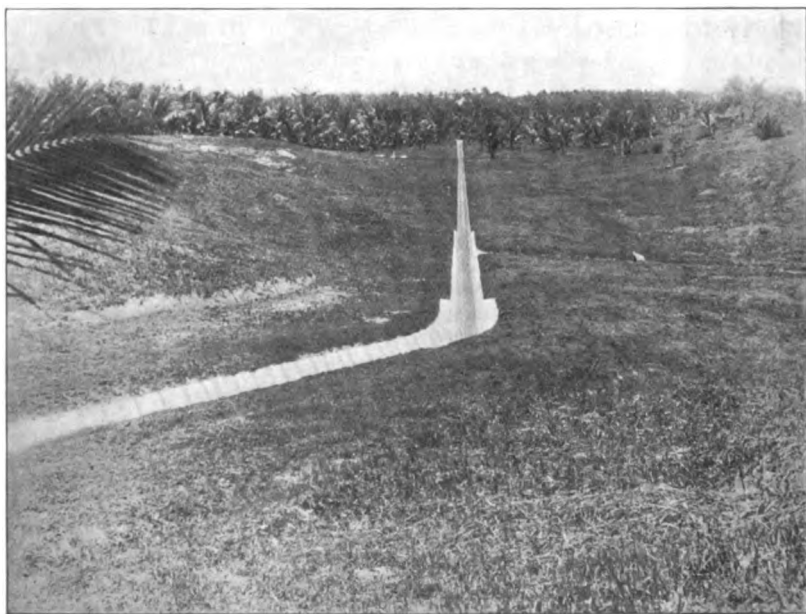


FIG. 7.—Banana Tree Valley—Selarang Park. Completed work showing dry grassy valley.

Selarang Park.

On a ridge of high ground here, situated across the broad Selarang Mangrove Swamp from Changi Cantonment, a number of Officers' Quarters were to be built and so a whole system of valleys round the foot of the ridge had to be treated before these quarters were finished and occupied. These valleys, with their thorny, trailing undergrowth growing out of

unwholesome looking swamp water, looked a horrid proposition when I first walked over them in the company of the Commander, Royal Engineers, and Captain Farewell. In places near their headwaters I found *A. maculatus* larvæ so the valleys had to be drained, although it did not look as if much improvement could be hoped for. Yet the work was done and done very well, and when these valleys had been drained, the houses built, and the higher ground of the ridge cleared of its trees and pineapple fields, and grass was growing smoothly over it, the Chief Engineer of the Command gave the district the name of Selarang Park; this name, I think, is a striking tribute to the excellent result of the work done here.

The main outlet of this system discharges into the edge of the Selarang River Mangrove Swamp; but the swamp itself, so far as it is tidal and therefore a salt water swamp, was left alone as is the custom here. But the formerly boggy ground along the edge of the swamp is now dry firm ground and grass is growing over it. The lines taken by the channels of the drainage system can be seen clearly on the map (fig. 5). The photograph of Banana Tree Valley (fig. 7) shows how the drained valleys now look; I regret I have not a photograph showing how these valleys looked before treatment. The total foot-run of all the drainage channels, both surface and subsoil, introduced into this system amounted to almost two and a half miles.

THE SOUTH CANTONMENT PADANG AND THE INDIA BARRACKS SWAMP.

The last completed drainage systems in the Changi side of our area are situated on the north end of a long line of low lying swampy ground which runs almost continuously from the Fourteenth Mile River eastwards of and along the line of the Changi road back almost as far as the Tanah Merah River. This line runs along the bottom of the eastern slopes of the Changi Area Hill system and in the past it was really the water-logged left bank of the Changi River, a tidal creek which follows a tortuous course northwards in its effort to break through the sand-dune which has formed between it and the sea.

The first area treated was the low ground running northwards from the bend in the Telok Paku Road (fig. 5). Running along and parallel to the eastern edge of the new South Cantonment Recreation Ground there is a low lying bank along which the ground drops some ten to fifteen feet. An intercepting subsoil drain was put in along the foot of this bank and the ground below this cleared and levelled and straight concrete channels put in. This dried the swamp down to the main open channel and even improved matters on the eastern bank, but the further treatment of this side forms part of the problem of the improvement of the whole Changi Creek swamp and this will probably be a big scheme and will have to be dealt with in the future. This is a possible area for *A. sundaicus* (ludlowi), but up to the present its larvæ have not been seen, although *A. bæzai* (Gater), which is generally found associated with *A. sundaicus*, has been found.



FIG. 8.—Swamp to east of New Padang South Cantonment. Soon after completion of drainage work.



FIG. 9.—Swamp to east of India Barracks. After preliminary clearing prior to commencement of drainage work.

Fig. 8 shows this area, but it was taken too soon after the work was completed to show a grass covered floor. A photograph of the India Barracks Swamp before drainage, fig. 9, shows the same ground only a little further to the north and indicates what this area was like before drainage. Preliminary clearing had been done before this picture was taken.

On completion of the work on the New Padang Swamp, work along similar lines was carried out in the water-logged ground in front of the new India Barracks which are now occupied by Indian troops. The outlets of the ground drainage here were led northward into the Fourteenth Mile River open concrete drain. The soil through which the trench for the subsoil drain was dug was of the sandy and light chalky clay type which I have already described, and although the trench was about seven feet deep in most places it was difficult to realize that much water was contained in it, yet when a line of four-inch pipes was put in the water promptly flowed through it and continued to flow to full bore. Accordingly another line was laid alongside the first and even now both lines are running half bore which is still rather too much as these pipes should not flow more than about one third bore; they should be able to take at least three times the normal dry weather flow to allow for increased flow after heavy rain. In order to estimate beforehand the size of subsoil pipes that should be used, experience will usually be a sufficient guide, and it is only by practice in this work that the necessary experience can be gained. In this case the large amount of water in the swampy pools below should probably have been a sufficient indication of the size of the pipe required.

FUTURE DRAINAGE SCHEMES IN THE AREA.

With the exception of a description of the Bee Hoe Valley where a small system of open concrete channels has been put in to the west of the old railway embankment, to the great improvement of this former market garden valley, I have completed the account of the anti-malaria drainage work carried out in the War Department Area up to date. Much as I should like to, I do not feel justified in writing about further drainage schemes which it is proposed to carry out in this area in the future, as I am leaving the Station in a few days on transfer to the Home Establishment and the detail of the drainage in connexion with the carrying out of these schemes has yet to be worked out, and this might cause an alteration in many of the ideas I have already formed as regards what should be done. I have shown, however, on the eight-inch map systems which I have already proposed, and I have every reason to hope that these will be carried out to a greater or less extent.

In the light of our experience there is one point of importance which needs careful consideration, as it will present a problem in the carrying out of some of the more important future schemes, and that is the level of the outlet of systems which discharge directly into the sea. At Tekong and Pengerang the method of laying open inverts in the beach sand and letting

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them discharge only a little below high-tide level has not been successful, as not only do they become heavily silted up with sand brought in by the incoming tide, but the concrete inverts get knocked about by the waves and are constantly being broken and displaced. The outfalls of the North Cantonment Padang in Changi, which were put in in 1928 or 1929, have stood the test of time much better, and here the cast iron pipe outfalls which run through the beach and discharge under a flap at a point well below the high tide level still work well without giving any trouble. It is most essential that outfalls of drainage systems into the sea should be led through the piled up sand-dune of beach sand in closed pipes or concrete ring channels out to the mud of the sea floor and should end at low neap-tide level, not just a little below high-tide level. From the anti-malaria point of view tidal water entering a drain does no harm, only good, and if the low point of the system is at neap-tide level it gives the engineer many feet of extra fall which can be taken advantage of to give steeper gradient to the channel of a system in the coastal flat lands and can be made use of right to the head of the system. Engineers are inclined to say that such a procedure is not even feasible, but it can be done, and, moreover, it is a necessary anti-malaria measure and not merely a problem of surface drainage.

There are still a number of tidal mangrove swamps in the area where larvæ of the dangerous *A. sundaiicus* are abundantly found. In many places the trees have been cut down by the local inhabitants and this has allowed the entrance of sunlight to pools, rendering them attractive to this mosquito; also these pools get water only at the highest tides, between which the salt water is diluted by rain to a degree favourable to the breeding of this species.

Mangrove swamps are not dangerous if they are left alone, and the only measure necessary is to open up these pools by earth channels to allow free entrance and exit of tidal waters.

GENERAL REMARKS.

The geographical features of the area and the climatic conditions do not require more than a brief mention as I have already referred to them in various places.

The rainfall is 100 to 110 inches per annum evenly distributed throughout the year and falling mostly in the form of short but heavy tropical down-pours. Droughts of about a month's duration are infrequent, but do occur, and when present these conditions are favourable to mosquito breeding as undetected seepages, etc., remain undisturbed and are not agitated by heavy rain showers. Temperature conditions are, of course, favourable for mosquito breeding throughout the year, and there is no marked seasonal prevalence of mosquitoes, except to some extent in the case of certain species which have two peaks, one in spring and one in the autumn, when they are more prevalent than at other times.

The larvæ which I have found most common in this area during the time I have been here are the following in order of frequency of occurrence :—

(1) *A. hyrcanus (sinensis)*; (2) *A. kochi*; (3) *A. maculatus*; (4) *A. sundaicus (ludlowi)*; (5) *A. umbrosus*; (6) *A. vagus*; (7) *A. karwari*.

The last three used to be fairly common but have not been found recently. Two more uncommon varieties have been *A. bæzai* (Gater) and Swellengrebel's larval variation of *A. umbrosus*, both of which have been obtained in the brackish water at the edge of tidal swamps. *A. maculatus* and *A. sundaicus* are considered to be much the most dangerous carriers, and anti-malaria measures are specially directed to water containing such larvæ.

In spite of all the permanent drainage work which has been done anti-malaria oiling has been and still is being carried on continuously, but unfortunately, owing to steady outward extension of the area requiring to be protected, it is not possible to form an idea of the saving in the cost of anti-malaria oil due to the drainage work.

The cost of drainage work has been heavy; from the beginning of 1934 to the present time it has been over £14,000 for a foot run of both open and underground drains amounting to fourteen miles in all. The area of the land in War Department possession amounts to at least six square miles, but not more than two-thirds of this has yet been affected by drainage schemes. The question of the justification of the expense incurred is to some extent answered for us by the effect of these measures on the island of Tekong where malaria prevailed to an almost alarming extent before the drainage work was done and where no malaria whatever has occurred since drainage was completed. Malaria is endemic in the native population here and always ready to become epidemic, and the necessary very close supervision of coolies employed in oiling is difficult to maintain even if the personnel for this supervision is available. Moreover, the chief argument in favour of drainage work is its permanency in comparison with oiling, which is purely a temporary measure, and it is obviously not desirable to continue such a procedure for generations during the existence of a Military Cantonment. We have already seen how work which was done seven years ago is still serving its purpose in a most satisfactory way, and that the anti-malaria drains put in on War Department land in Blackang Mati in 1915 are likewise still giving good service.

CO-OPERATION BETWEEN THE MEDICAL AND ENGINEER SERVICES IN THE CARRYING OUT OF ANTI-MALARIA DRAINAGE.

This co-operation is a matter of the very greatest importance and it is in the hope that my experience during the last two years may be of assistance to other medical officers in the Service who may be called upon to use the Malayan method of anti-malaria land drainage that I am writing this account. Work should not be put out to contract labour as co-operation with the contractor is certainly going to be less easy to obtain than with the Royal Engineer officers in the station. In this case the

contractor has something to gain by scamping his work if he can do so unseen ; and he is most unlikely to understand the biological reasons which call for the carrying out of this work. Actual experience here supports this contention. With officers of the Royal Engineers, the health or anti-malaria officer can have frequent free discussions about the work both on the ground and in the office or mess, and these discussions are a pleasant feature of the medical officer's day. An even balance must be maintained between the parts played by the Engineer officer and the anti-malaria officer. The latter must remember that although the Royal Engineer officer carries out the work and seems to play a larger part in the putting in of these drainage systems, yet he is under no obligation to learn anything of the detailed life history of the mosquito, or of the breeding habits of certain species, or of the chemical differences in ground and surface waters, or of the relations of plants, aquatic and surface, to mosquito life, or of the carrying range of various anopheline species, and a host of other things which all come into the problem. Consequently from first to last the medical officer must keep a constant watch over the work. Each scheme presents a different problem, and the behaviour of ground water is a study in itself. It is the anti-malaria officer who must prove the fact that larvæ are present in a valley or swamp, who must identify these and state whether they are dangerous carriers or not, and whether the breeding place is within carrying range of present or proposed occupied buildings. He must be able to recommend the measures most suitable in each case and suggest the size of pipes required, he must also be able to visualize future conditions and keep a careful watch on proposed engineering projects in the area which may not seem to be directly connected with drainage, but which may eventually obstruct the flow of ground or surface water to the sea. I refer principally to rail or road embankments, to bridges or culverts connected with them, and reclamation schemes.

The chief point at which the anti-malaria officer's point of view will differ from that of the Engineer officer is in the question of fixing the point of the outfall of a system which discharges directly into the sea. In the case of a short system which slopes down to the sea-level the level of the outfall scarcely matters, but in the case of a broad sea-level flat it matters greatly. The engineer is concerned to lead off free surface water to the sea, but the anti-malaria officer wishes to draw off water from under the surface of the ground and discharge it into the sea. In Changi, leaving exceptionally high tides out of account, the difference between high and low water at neap-tides is about eight feet. Therefore, if the point reached by low water at neap-tide is taken as the outfall, this gives the system eight extra feet down to which the drainage system may slope, and this means that a system may be carried thousands of feet further back than would be possible if high water level were taken as the outfall point.

Another point in the construction of these drains which the anti-

malaria officer should stress is that buried subsoil drains are cheaper to put in, easier to maintain, and safer from the anti-malaria point of view than surface drains, and unless open channels from underground drains to the central channel of a system are required to carry storm water or house sullage water, the subsoil drains should be taken underground right to the central channel.

Before concluding this account of the land drainage that has been carried out in an area during the last few years I think that in reviewing briefly the state of affairs in the treated areas before and after drainage, a great deal of credit must be given to the Engineer Services for what they have accomplished by their work in these places. The reader must remember that Changi is situated in the equatorial zone of the earth's surface and in this zone the rainfall is heavy and the temperature is genial, that vegetation grows with a denseness and rapidity that soon swallows up the handiwork of man if not vigorously kept at bay. To undertake to clear a dense and steamy jungle swamp and transform it into a sunlit grassy valley, requires both boldness and enterprise, and although we had the example of the Singapore municipal work of the same kind near by, yet some of our work in the more outlying parts was in jungle more virgin in nature than that in valleys nearer the town.

CONCLUSION.

In the Service the Medical Officer is fortunate in that he is closely associated with the officers of the Engineer Services. In Changi I have found that the Royal Engineer officers were not only most willing to carry out anti-malaria work, but they became keenly interested in it in spite of the enormous amount of building and other construction work that was going on elsewhere. That so much of the work has been done in the time has been due to the moral support and practical advice and encouragement given by Colonel J. R. Roberts, O.B.E., M.C., R.E., the C.R.E. The two D.C.'s R.E., Major E. B. Elkington and Captain J. Farewell, and Captain Brownlow, Garrison Engineer, Tekong, are the other Royal Engineer officers who most ably and willingly have taken the burden on their shoulders during the past two years.

From Dr. J. G. Scharff, Chief Health Officer, M.C.S., Singapore, I received my first introduction to this fascinating study. Whenever difficulties have arisen, he has always been ready to make the long journey out here and give us the benefit of his wide experience. If I have quoted from his teaching I know he will be only too pleased, especially if he thinks that by so doing knowledge of the work is likely to be spread.

To Colonel P. Power, formerly S.M.O., Malaya Command, and Colonel E. Gibbon, the present A.D.M.S., I am also indebted for the warm encouragement they have both invariably given in supporting proposals to have the work done and for the interest they have displayed while it was in progress.

My thanks are due to Colonel E. Gibbon, O.B.E., A.D.M.S. Malaya Command, for permission to forward this article for publication.

SOME CASES OF RELAPSING FEVER IN PALESTINE.

BY LIEUTENANT R. J. G. MORRISON, M.D.,

Royal Army Medical Corps.

THE following is an account of four cases of relapsing fever which were admitted to the Reception Station, Jerusalem, during the recent disturbances in Palestine.

Relapsing fever exists in two main groups, one transmitted through the agency of the louse, and the other by the tick. Various local types, differing in clinical manifestations, are described, such as the Central African, Persian, and Moroccan forms of the disease. The micro-organism responsible is in all cases a spirochæte.

Of the ticks capable of conveying the disease the *Ornithodoros moubata* is the best known, but it has been well established that other species of tick can do so.

In Palestine relapsing fever appears to be rare and the *O. moubata* is stated not to exist in this country.

In recent months Adler, Theodore, and Schieber (1936) traced a small outbreak in Palestine to infection from a cave infested by the tick *O. palpillipes*. They were successful in transferring the infection from the ticks to laboratory rats and demonstrated spirochætes in the blood of the rats. They further showed that infection occurred directly through the bite, and not through the fæces or coecal fluid as in the case of *O. moubata*.

Adler (1936) states that the bite of this tick is painless and that its most characteristic feature is a hæmorrhagic mark which persists long after the lesion has healed.

Moskwin (1929) had previously been successful in transmitting the *Spirochæta sogdianum* through *O. palpillipes*, and Dvolaitzkaya-Barischewa (1931) considers this tick to be the only vector in Central Asia.

Infection from the tick is usually acquired by sleeping in a cave or native dwelling.

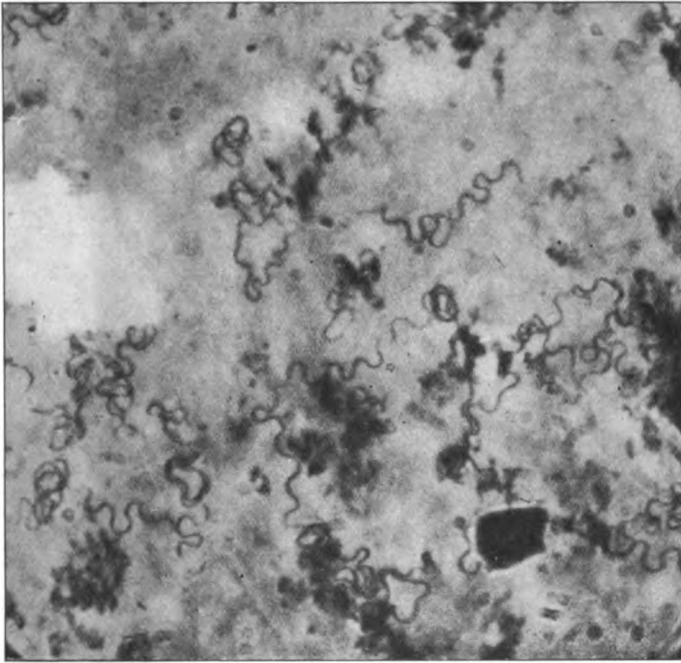
As regards the spirochæte it is not yet definitely known whether the same organism is responsible for the different forms of relapsing fever. Morphologically at any rate the organisms of the several species are indistinguishable and Wenyon (1926) states that clinical differences, serological cross-immunity tests, and the variations in the susceptibility of laboratory animals to inoculation are not reliable methods of differentiating the species. Adler, however, has examined the spirochætes from the cases described in this article and considers these to be examples of *S. sogdianum*.

The four cases described have certain factors in common. The patients all belonged to the same battalion and whilst on active service were

compelled to spend the night of July 16, 1936, in what is described as an open cave or natural dug-out. They were all admitted to the Reception Station, Jerusalem, on the sixth and seventh day after this. They all had fever which subsided after a variable period, only to relapse.

In three of the four cases spirochætes were found in smears of the peripheral blood after staining with Leishman's method, and this was later confirmed by hæmolysed "thick drops" stained by Giemsa's technique.

Eight cubic centimetres of blood were removed from a vein of one of

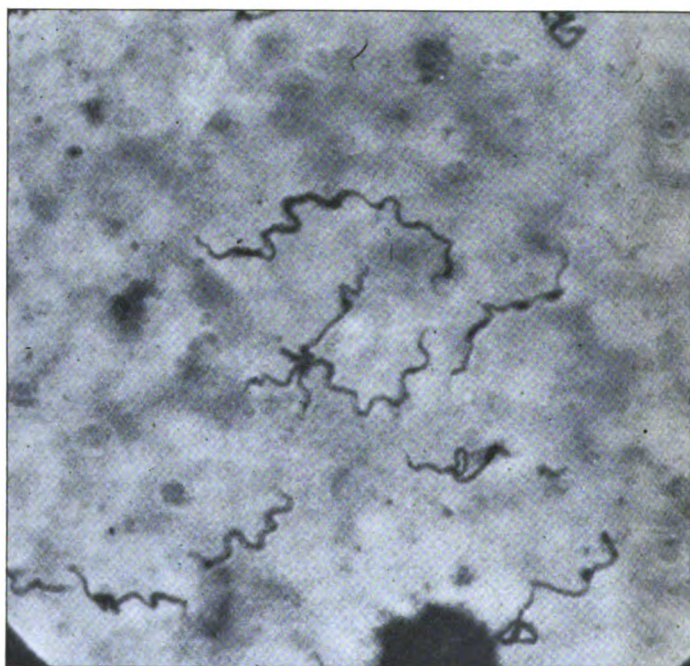


Spirochætes in the blood of a guinea-pig. Photograph by Dr. Krikorian.

the patients (Lance-Serjeant G.) and two cubic centimetres of blood were injected into the peritoneal cavity of each of four guinea-pigs. All the guinea-pigs became ill and spirochætes were demonstrated in the blood of all the animals. Blood taken from the guinea-pigs and injected into pigs, white mice, and rabbits reproduced the disease. In rabbits the condition appears to be short-lived, and two which were inoculated on August 10, 1936, became negative on August 25. One of these was reinoculated on September 16, with a Palestinian strain of spirochæte (*S. sogdianum*) obtained from Adler. This animal has shown only one spirochæte in two thick drops of blood examined. This resistance to reinfection might be suggestive of identity of the strains.

No ticks or lice were found on the person or clothing of any of the patients and a medical inspection of the rest of the battalion did not disclose the presence of any vermin. None of the patients could remember having been bitten by lice or ticks.

The diagnosis was arrived at in the following manner. When Lance-Serjeant G. was admitted a blood smear was taken and stained by Leishman's method. A body having the appearance of a spirochæte was found. The possibility of relapsing fever was discussed, but as no other spirochætes were found in the slide and seven subsequent slides were all



Spirochætes enlarged to show curious nodal swellings. Photograph by Dr. Krikorian.

negative, the patient was discharged on the tenth day of his illness, after the temperature had been normal for four days.

He was readmitted with fever on the twelfth day of the disease and spirochætes were found in the blood.

On directly questioning the patient the history of exposure in the cave of himself and his comrades was obtained.

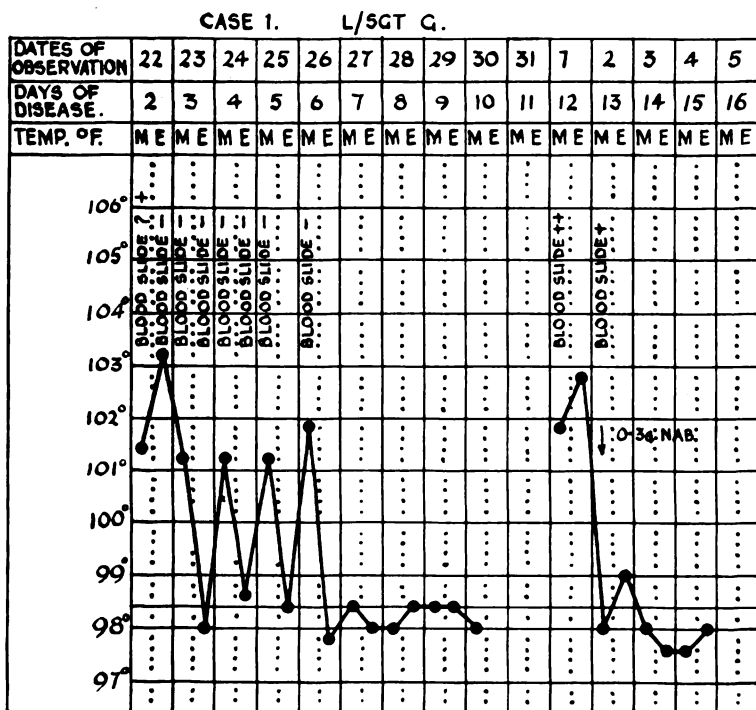
Case 1.—Lance-Serjeant G. *History*: One day before admission became ill with frontal headache, localized to the orbit. Some pain low down in the back. Pain low down on the left-hand side of the front of the chest on inspiration, but no cough or sputum.

He felt alternately hot and cold and was shivering. Nausea was present and on one occasion some greenish fluid was vomited.

Giddiness was a marked feature and sweats also occurred. The bowels were stated to be open regularly.

Past History and Family History.—Nothing with any bearing on the case.

Condition on Admission.—Temperature 101.4° F. Pulse 96. The conjunctivæ were suffused. The tongue was moist with a thick brown fur. There was some redness of the posterior pharyngeal wall. No abnormality was detected on examination of the eyes, neck, axillæ, heart, lungs, or abdomen. The spleen was not palpable. A small area having the appearance of an infected insect bite on the outer aspect of the left calf was observed.



The urine contained excess of urates but no abnormal constituent was found.

Progress.—The pyrexial period ended by crisis on the evening of the sixth day of illness. The highest fever observed was a temperature of 103.2° F. on the second day of disease. The morning temperature varying between 101-102° F. was the higher, the evening temperature approaching normal.

Headache persisted, and the patient had several rigors heralded by an intensification of the headache.

The spleen became palpable on the fourth day of the disease. It was firm, smooth and tender and enlarged to an extent of one fingerbreadth below the costal margin. Pallor was a marked feature which developed rapidly and was treated by the administration of ninety grains of iron and ammonium citrate daily. Seven blood slides were negative for spirochætes and malaria parasites after the first blood examination.

The patient felt quite well after the fever subsided on the sixth day. He was discharged on the tenth day of the disease.

The patient was readmitted on the twelfth day of the disease, having complained of a fairly severe nose-bleeding and of a shivering attack. He had vomited, and the vomit contained clotted blood. He was feeling giddy. The temperature was 102° F. The spleen was still enlarged. A blood slide showed the presence of numerous spirochætes, and next morning the patient was transferred to the Royal Air Force General Hospital, Sarafand. Here 0·3 gramme N.A.B. was administered intravenously, and the temperature which had been falling became normal.

A second milder relapse occurred eight days later, on the twenty-first day of the disease. The pyrexia persisted for forty-eight hours, and the highest temperature reached was 100·8° F. The lesion on the left calf had now a hæmorrhagic character, being circular and slightly raised above the surrounding skin, and about quarter-inch in diameter.

Since this time the patient has remained well.

Case 2.—Serjeant B. *History*: One day before admission he complained of occipital headache, shakiness, and was somewhat giddy. There were pains in the large joints and vague abdominal pains. A very slight cough was present. The bowels were well open, and no other symptoms could be elicited.

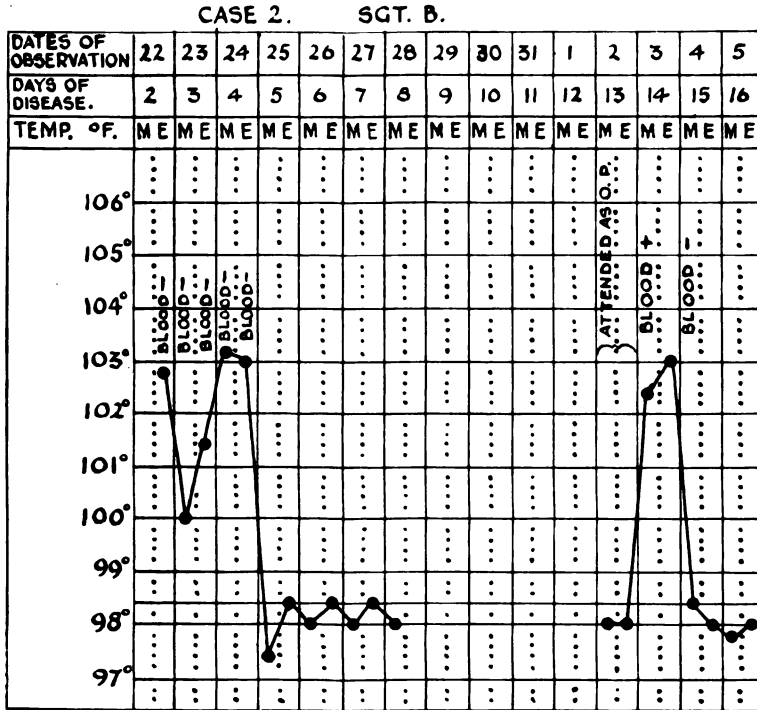
Past History and Family History.—Malaria in 1922. Four attacks during a total duration of six to eight months.

Condition on Admission.—Temperature 102·8° F. Pulse 106. The conjunctivæ were suffused and the tongue was furred. The urine contained no abnormal constituents. No abnormal physical signs were found.

Progress.—A continuous pyrexia occurred which fell by crisis on the fifth day. Apart from headache and feeling tired, the patient did not feel particularly unwell; but he looked pale and drawn. The spleen was enlarged. The patient was discharged on the eighth day, after the temperature had been normal for four days.

When the spirochætes were discovered in the blood of the first case, Serjeant B. was asked to attend the Medical Inspection Room twice daily. After attending for one day with a normal temperature a relapse occurred on the fourteenth day of the disease. Temperature was 102·6° F., and pulse 100. Spirochætes were found in the blood in scanty numbers. Three in all were found during prolonged search. He had no symptoms, and stated that he felt quite fit for full duty. He was transferred to the Royal Air Force General Hospital, Sarafand, and 0·3 gramme N.A.B. was

administered intravenously. Next morning the temperature fell to normal and no further relapse occurred.



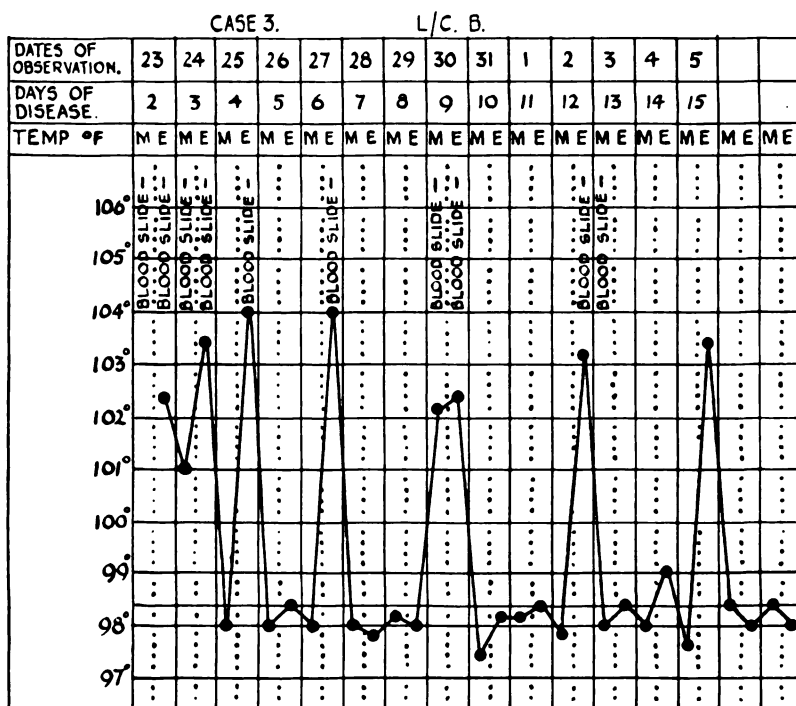
Case 3.—Lance-Corporal B. *History* : One day previous to admission he complained of pain behind the eyes. This was shortly followed by a shivering attack. He felt giddy and unsteady on his legs. There was nausea but no vomiting. There was some pain on inspiration in the left upper abdominal quadrant, but no cough or sputum.

Past History and Family History.—Nothing with any direct bearing on the case.

Condition on Admission.—The temperature was 102.6° F., pulse 100. Tongue furred; sweating; urine contained a trace of albumin. No abnormality detected on physical examination.

Progress.—The fever was largely of intermittent type and reached 104° F. on two occasions. The peaks were usually in the evening. The pulse was not markedly raised. Headache and drowsiness were prominent features and pallor developed rapidly. Rigors occurred and were severe. Cyanosis of the lips was present to a moderate degree but no changes were found in the heart or lungs. The spleen became palpable on the third day and was firm, tender and smooth. It was enlarged to an extent of two fingerbreadths below the costal margin. Blood slides were negative for spirochætes and for malaria parasites on ten separate occasions. On the

thirteenth day the patient was transferred to Sarafand where spirochætes were found in the blood on the fifteenth day. He was given 0·3 gramme N.A.B. and the fever subsided; he has had no relapse.



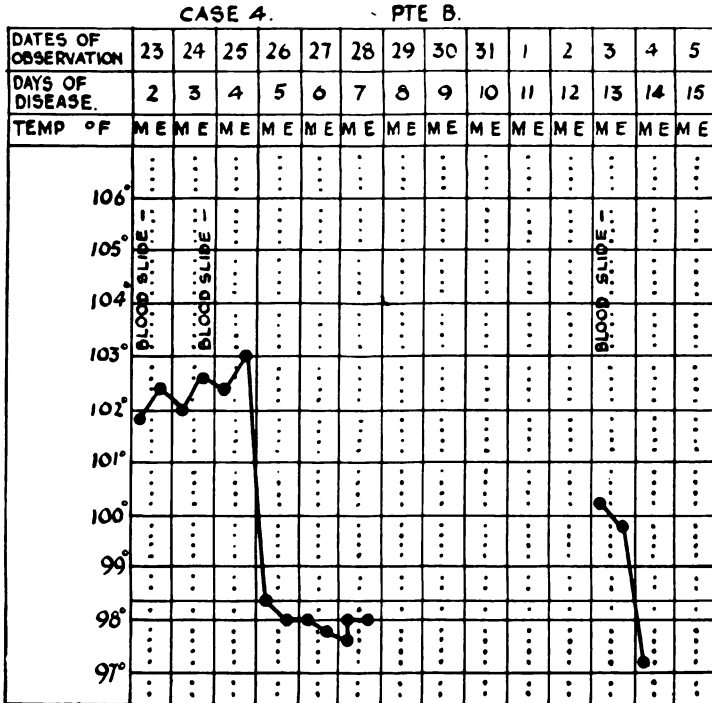
Case 4.—Pte. B. History: One day prior to admission complained of pain behind the eyes. This was put down by the patient to eye-strain from range-taking. A shivering attack followed. Feelings of lethargy and giddiness were complained of.

Past History and Family History.—Nothing having any bearing on the case.

Condition on Admission.—Temperature 101·8° F.; pulse 88. Eyes suffused. Tongue moist and thickly coated with brown fur. There was erythema of the neck, face and chest which lasted only a few hours. No other abnormal physical sign was elicited. The spleen was not palpable. The urine was concentrated but did not contain any albumin or sugar.

Progress.—A continuous fever for three days was present, the temperature recorded always being between 102° and 103° F. and falling by crisis on the morning of the fifth day. Slight cough was present on the fourth day, and an occasional rhonchus was heard in the chest. Three slides of blood were negative. He was discharged feeling fit on the eighth day. On the thirteenth day the patient was sent for and the temperature was

found to be 100.3° F. He stated that he felt quite fit. No spirochætes could be found in the blood and he was transferred to Sarafand. Next morning the temperature was normal, and remained so until the twenty-



second day of the disease when a slight attack of fever occurred. The temperature was raised for twenty-four hours and reached 103° F. No spirochætes were found in the blood, and no arsenical treatment was given.

CONCLUSION.

Four cases of relapsing fever are described and in three of them spirochætes were observed in the blood. It is regretted that full facilities were not available for a thorough investigation of the cases.

The cases are probably tick fever, as the history of exposure in a cave renders this likely.

There is a clinical similarity to sandfly fever in the frontal headache, injected conjunctivæ and general malaise. The danger of the two conditions being confused is enhanced by the fact that the first relapse may be practically symptomless, and thus if the patient is not under observation the relapsing nature of the fever might be overlooked.

The cases also demonstrate the fact that spirochætes are not always readily found even though the temperature is high, and they may be very

scanty and require prolonged search. They seem most likely to be found at the time of the first relapse. I think a thick drop of blood stained by Giemsa's technique is the most reliable method in the absence of dark ground illumination.

I am indebted to Major-General W. P. Mac Arthur, D.S.O., O.B.E., K.H.P., and Group Captain Biggs, M.C., Royal Air Force, for permission to send these cases for publication; to Major H. Alcock, Royal Army Medical Corps, for help and advice; and to Dr. Krikorian, Senior Bacteriologist, Jerusalem, for the animal experiments and the photomicrographs.

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THE SCHOONER "ISABELLA"—CONVERSION FROM TRADER TO YACHT.

BY MAJOR-GENERAL H. CARR, C.B.

As there is a large number of the Corps interested in yachts and sailing in general, I think an account of the acquisition and conversion of a trading topsail schooner to a yacht may be of interest, more especially as the purchase and work had to be effected with the minimum of expenditure because of the poverty of her present owners. This is a point to keep in constant view as half the interest and excitement is due to the necessity of doing the work with the minimum of skilled labour and of hunting round yacht yards and ship-breaking firms to find the hundred and one articles required, varying from skylights, companion ways, hatches, etc., to masts and sails, in fact everything that a sea-going vessel requires, with the exception of a hull and ground tackle.

Every would-be owner has not the time nor the knowledge for this work, and before commencing the story I think it will be well to describe the principals in the venture.

First there is the owner, "T. H.", next "A.", his wife, and thirdly, "H. C.", not actually engaged, and last, but by no means least, "C. N.", a member of a well-known firm of yacht designers and builders.

"T. H." commenced his sailing career at the age of six on the lake at Naini Tal, and has ascended in the last twenty-five years from dinghies, half-decked boats, 3-tonners, 6-tonners, 14-tonners and a Thames Barge, to finally "Isabella," a 160-ton topsail schooner. Without "A.", his wife, the scheme would have been impossible. Both are exceptionally strong physically, and "A.", in the last four years, has become a really efficient hand. I dwell on these characteristics as I could not recommend anyone, unless endowed with ample funds, to attempt a like venture unless he or they are real practical seamen with not only a sound knowledge of seamanship and motors, but the strength to manipulate heavy gear.

The story begins with "T. H." and "A." seeing in a Yachting Paper the following advertisement :—

"Schooner 'Isabella,' of Barrow, just passed survey under Board of Trade supervision, extra strong little vessel, make ideal cruiser or training ship for boys.—B. Tregaskes and Sons, Dry Dock, Par, Cornwall. Sept., 1934."

As three years on a Thames Barge, converted by their own unremitting exertions into a really comfortable, warm, commodious home, had created a desire for a deep-sea boat capable of long cruises, and as "T. H." for many years had had his heart set on possessing a yacht with square rig, the advertisement at once caused the smouldering fire to burst into flame, and they wrote to the advertiser in Par, Cornwall, for full particulars and price. The reply proving eminently satisfactory in every respect bar the

price, they made a personal inspection and returned determined to purchase her. Haggling continued for about a year, there being no market now for this class of schooner, the trade being killed by motor vessels. Finally, "A." having come into a small legacy, a deal was effected subject to survey and "T. H.", "C. N.", and "H. C." made a prolonged and thorough survey of hull and gear, "C. N." being the technical expert. She was passed sound. Her description is as follows—for the benefit of readers not versed in the technical names employed by builders, I will keep to simpler phraseology. The following is an extract from Lloyds Register of Yachts, 1936: "'Isabella,' Aux. Schooner, 162 tons. Thames measurement: Length 88·5 feet, breadth 21·25 feet, head room 7 feet, draft 7·5 feet. Built at Barrow, 1878, primarily for the trade between Labrador and England." She was constructed, even for that time, exceptionally strong and of the very best materials. Her planking under water is American elm, pitch pine garboard, frames of moulded oak 8 inches—each alternate frame is reinforced by an iron hanging knee extending to within two inches of the keelson. Her planking is 3 inches thick and her keelson of green-heart is 15 by 18 inches. The cargo floor is green-heart. There is also a green-heart ice protector strake on the water line. Both booms and bowsprit are pitch pine and the masts oregon; keel and stem are of oak.

Although the survey passed the hull as absolutely sound and in splendid condition, her mainmast was condemned, and one gaff. All her sails were useless with the exception of her top-sails and jib. It was arranged with the shipyard at Par to bore and fit a stern tube and bearers to take a 60 h.p. Kelvin motor engine while she was in dry dock, supply a new mast and repair the foremast, supply new main shrouds and hand her over in a sufficiently sea-worthy condition to sail up to Southampton or an East Coast port—all for an inclusive sum which, although moderate, was terrifying to the venturesome couple "T. H." and "A.", whose only asset of any great value was their Thames Barge on which they were living and which was unsold.

"H. C." now, although at first strongly opposed to the purchase of so large a vessel, became a convert, and being convinced that the headstrong pair had acquired a valuable and workable proposition, came to the rescue with financial aid, seasoned with lots of advice which, although listened to respectfully, was generally disregarded.

The Bill of Sale was signed in November, 1935, and "Isabella" was ready to be taken away.

It now became necessary to decide how she was to be moved from Par to Southampton. Naturally the easiest way was to arrange a tow, but here expense had to be seriously considered, and after much discussion a crew of amateurs was collected, including "T. H." as skipper, "A." his wife, "C. N." and two others, one of whom is a well-known amateur and skilled yachtsman. These, taking with them sails which they persuaded the Railway Company to regard as personal luggage, arrived at Par in the first

week in November and took possession just about one year after negotiations had opened. As all the crew had limited leave of absence, an early start was essential, but the rigging on the main-mast was not complete, it was blowing a full gale, the weather forecast from Calshot was bad, so after three days had passed and time was short, a tow was arranged with a local company, and on November 8 they started at noon. By 1.30 they had cleared the harbour, and "Isabella," being without ballast, rolled and plunged furiously. As a detailed extract from the log would bore all but deep-sea sailors who know the South Coast, I will summarize and just say that they ran into a gale from the south-west and very nearly were blown on to Portland Bill. The night was really dirty, torrents of rain, and a heavy swell making it a nightmare passage, not improved by a fire breaking out in the after cabin from too vigorous stoking of the stove, which fire required the application of many buckets of water, adding much to the discomfort of the crew. However, the little tug proved equal to the task and safely landed them in Southampton Water at 3.30 the following day, having well earned the £45 paid for the tow.

All parties being now convinced that "Isabella" was a real beauty in her class and worthy of being converted by skilled labour, as distinguished from the amateur work that "T. H." and "A." had put into their Barge. An arrangement was made that she should be berthed at Camper and Nicholson's yacht yard at Northam, and converted by them under the most favourable terms possible. Accordingly, one shipwright and one joiner were detailed for the job; much to our comfort and advantage, they both were left with us permanently, becoming quite interested in the work and most helpful and friendly.

The lay-out of the interior had been worked out by "T. C." most carefully to scale and had been revised and altered again and again. The experience of living permanently on board the Barge proved most valuable in small details which would not strike the professional designer or the ordinary owner who only lives on board for week-ends or a couple of months in the summer. Time after time "A." altered the position of cupboards, sinks, draining boards, taps, etc., by the light of her personal experience.

The first step was naturally to remove surplus iron from the open cargo hatches and deck them over, leaving spaces for the large skylights which each carried. While the shipwright worked on deck, the joiner was laying the floors and erecting bulkheads and partitions. Before the flooring could be permanently laid, the four steel water tanks, each holding 250 gallons, had to be fitted along the keelson and connected, also the various pipes to pump, air vents, filling orifice, etc., made good. Thirty tons of pig iron ballast was packed aft and midships, all under the floor boards, resting on the original cargo floor and about six inches above the outer skin.

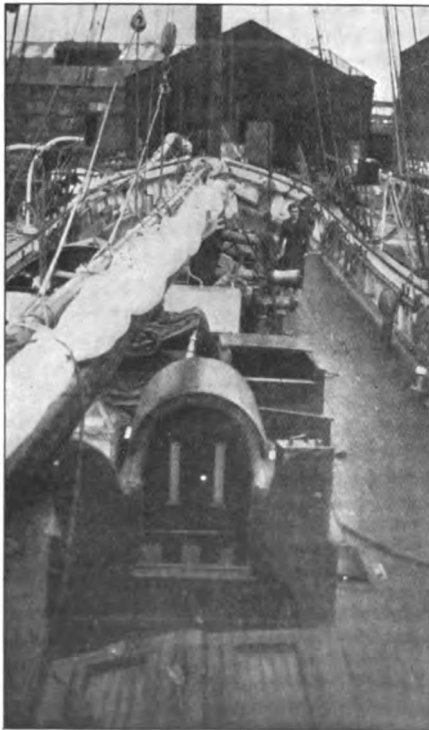
The conversion plan was as follows: The original bulkhead shutting off the after cabin where the skipper and mate berthed was not touched, nor was the cabin, also the bulkhead between the hold and the fo'c'sle and

98 *The Schooner "Isabella"—Conversion from Trader to Yacht*

sail-locker was left intact, and the original cargo hold was divided according to the plan by $\frac{3}{4}$ inch boards nailed to frames of 2 by 1 deal and faced on each side with "Sundeala" patent sheets; no teak or mahogany was used below, but these woods were used above deck; all skylights, hatches and companion ways being of the very best seasoned material in the most approved yacht finish.

As it was thought useless to cut portholes in the sides owing to the expense and the thickness of walls, all light and air came from above, and five large skylights, one main companion way and two hatches gave access to the ship, with no less than five large screw down portholes and four oblong deck windows with ten prismatic dead lights, made all the cabins both light and airy. In addition there were seven cowl ventilators, of which two were in the galley and two in the bathroom.

I will try and describe the alterations made in the appearance of the deck. From right aft, the wheel and steering gear are the same, the



Looking forward.



Looking aft.

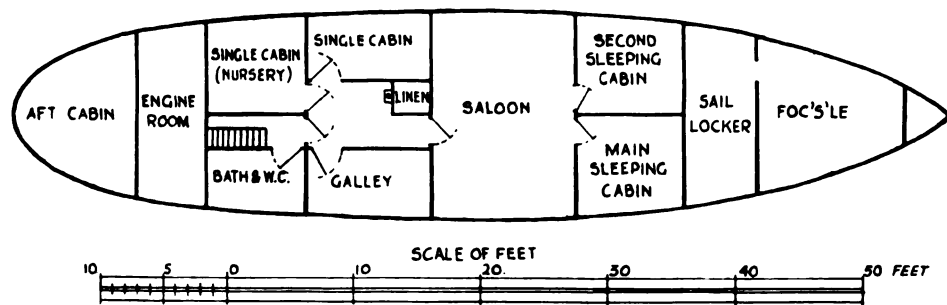
sliding hatch over the after cabin is untouched, an ugly skylight with solid top and side frames has been removed, and a teak yacht's skylight fitted. A large teak flat hatch gives access to the engine room. Then comes the main companion way with ladder and brass hand rail, and sliding hatch

set in the deck over the old cargo hatch, in which is a large skylight over the saloon. Then come two more skylights side by side over the forward cabins. The old cumbersome windlass for the anchor has been replaced by a geared winch; the original cargo winch has been retained for hoisting sails, etc. A new bilge pump has replaced the old cumbersome pump and the deck has been cleared of superfluous erections, such as the galley and round house, leaving a clear run from stem to stern.

The accommodation plan is as follows, from aft :—

The original captain's cabin with two bunks off it, now lit and ventilated by opening deck ports and separate companionways with sliding hatch. Next, the engine room, shut off fore and aft by bulkheads pierced by doors with large hatch in deck. This room takes the Diesel engine, a workshop bench and lighting plant. Then comes the entrance lobby with companion

"ISABELLA"
ACCOMMODATION PLAN.



ladder, under which is the oilskin locker, also a beer barrel. On the starboard side is the bathroom containing a full-size bath, basin with hot and cold taps, also a Blake w.c. Passing through a door one enters a second lobby containing the "Ideal" boiler with hot water tank overhead and hot cupboard. On the starboard hand is the galley and to port one large cabin and one single berth one. Next comes the saloon, 14 by 18 feet, with large skylights. Two double cabins open off this, containing double beds, wardrobes, chest of drawers, a writing table and dressing chest. This is the end of the original hold, and now comes the bulkhead. On the other side of this is a large sail locker and bosun's stores. Next comes the fo'c'sle with four spring cots, washstand, etc., and right up in the stem head is the lamp locker. Underneath the floor are the chain lockers containing the cables of the two anchors, 45 fathom of 1 inch stud link chain on each with 45 spare. The fo'c'sle is well lit and ventilated by two deck ports and is most comfortable.

The above comprises the whole accommodation. Everywhere, even in the fo'c'sle, there is ample head room and space.

It took considerable time and search to pick up all the "Isabella's"

requirements, but Southampton is a fertile field, as there are numerous ship breaking yards and marine dealers. Camper and Nicholson taking, as they do, old boats in part exchange for others, accumulate an enormous stock of spare and surplus parts. From them we got skylights, companion ways, spars, sails, davits and small gear of all kinds at junk prices, all being of the best yacht finish. Also we were fortunate in buying many cwt. of rope for our running gear, most of it in the original coils, which at one time was on a "Shamrock." Needless to say it was of the highest and most expensive quality. Pollock and Brown, the well-known ship breakers, also contributed, as did the Belsize Yard. The "Mauretania" and the "Majestic," when their contents were being sold, supplied Vi-spring mattresses and other small articles. By these means the total cost was kept within reasonable bounds.

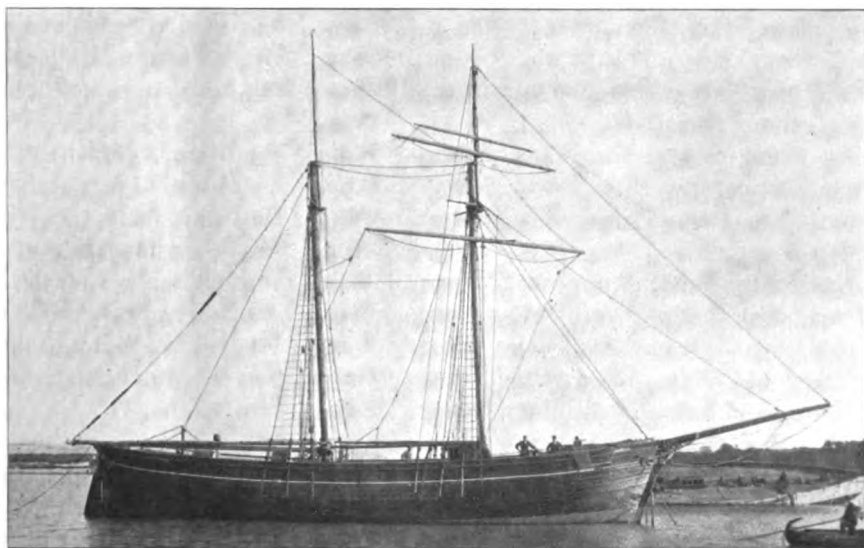
The engine question was a grave one—the original idea of removing the 60 h.p. Kelvin from the Barge was upset by her sale as she stood for an inclusive sum. A Ruston Hornsby 70 h.p. Diesel, lying at Camper and Nicholson's yard, was most suitable and tempting, but the price was prohibitive. However, having convinced ourselves that without a motor "Isabella" was too large to handle with safety without a much larger crew than was proposed, "H. C." hardened his heart and produced the needed funds, thereby adding enormously to the sale value of the ship and rendering it possible to take her into narrow waters and crowded anchorage without any qualms.

I am afraid the total cost has exceeded all the original estimates by many hundreds, but there is the consolation that we now have a beautiful ship, comfortable and seaworthy, in which there is not a soft spot in hull or gear, capable of sailing round the world and built of material good for a hundred years. All painting and varnishing, as well as the scraping of the old fittings that were picked up, were done by ourselves—painters are very highly paid and as it was imperative that the labour bill be kept as low as possible, none was employed. Fortunately we had a hand who was really expert and liked the work. The general colour scheme is cream colour walls, white underside of deck, with the oak beams coloured chocolate, also all the mouldings. The doors were painted teak colour with bakelite fittings—there is no brass to clean with the exception of the hand rail on companion ladders.

Three boats are carried, two in davits, one a motor launch, the other a C.b. sailing 14 foot dinghy, and a small dinghy on deck when making a passage.

All cabins are fitted with Vi-spring mattresses in standing bunks with chest of drawers underneath, and shelf and hanging wardrobes. The floors are stained dark oak and covered with rugs. The saloon has a swinging oak dining table set on the starboard side close to a settee, with a service sliding hatch in the bulkhead. There is ample room for four or five arm chairs, a round table, an Electrolux Refrigerator, and a Courtier stove, also cup-

boards, writing desk, etc. It will be noticed that no attempt has been made to mention prices, but even with the rigid economy practised, and the purchase of all fitting and gear, etc., at rock bottom prices, the vessel as she now stands represents several thousand pounds and is valued by experts at a fairly large figure. I may mention as of interest that we bought the winch from a steamer for £10, present value about £30; skylights new, value between £15 and £30, for £2 and £3; Vi-spring mattresses for 20s.; life belts from the "Majestic" for 1s. each; a double action bilge pump Army surplus for £3. With the exception of the wire rigging of masts and topmasts all the standing and running gear was renewed and fitted by "T.C." and a few nautical friends. The decks are dressed with boiled oil and



Topsail Schooner "Isabella." Owner, Flight-Lieutenant T. H. Carr, R.A.F.

red oxide as recommended by the late Dr. Claude Worth. In conclusion I wish to emphasize the fact that "Isabella" was built and shaped as a cargo vessel and no attempt has been made to camouflage her as a yacht although she is now as smart as paint and bright varnished fittings can make her.

We have been severely criticized by our knowing friends for going to Camper and Nicholson's for the necessary skilled labour, but we are firmly convinced that none of the small yacht yards with their limited machine shops and small resources could have handled the proposition effectively or more economically, even allowing for the perhaps exceptionally favourable terms we received.

On one point we were, I admit, defeated. Whenever we suggested a rough and quick way of doing a job we were at once against strong opposition, and told that such work could not be allowed to leave Camper and Nicholson's yard—everything done by the firm must be "just so"—of course any amateur work put in by us was our affair.

THE SEMI-AUTOMATIC TREATMENT OF SULLAGE WATER BY HATTERSLEY'S CHEMICAL METHOD.

BY LIEUTENANT-COLONEL T. O. THOMPSON, D.M.Oxon., D.P.H.,
Royal Army Medical Corps.

WORKING at the Army School of Hygiene, Hattersley¹ has devised and described a simple method of treating waste water with ferrous sulphate and lime by means of which contained impurities are sedimented as a non-greasy floc. From his description, and even from his very modest claims to success, it is obvious that this method is an extremely efficient and satisfactory one; and that under conditions of camp sanitation the method should prove an enormous boon in that difficult task, the disposal of greasy, camp sullage water.

In order to test this method under Indian conditions, certain of us, hygiene officers, were asked to carry out experimental trials on cook-house or bath-house water, and were allotted funds for that purpose.

After perusal of the details of the method and a consideration of the work already done, it appeared to us that the method itself was already proved, and that the point of our experiments would be, not a mere trial of the method in buckets, basins or tanks, but a trial of additional measures, which would utilize the method for practical purposes and demonstrate its efficiency and value in ordinary barrack or camp sanitation.

For this purpose, after some consideration, we decided to devise an automatic or semi-automatic and self-dosing apparatus with the idea of making the process fool-proof as far as practicable, on account of the personnel likely to be employed, and to eliminate constant supervision and personal attention.

We decided to use the effluent from the cook-house of the British Military Hospital, Rawalpindi, as it was as foul a collection of "greasy" water as we could find, and could receive attention by sweepers, who could be kept under control. It was also reasonably adjacent to the district laboratory from which the necessary chemicals could be issued and supervision maintained.

The Commanding Officer gave us permission to carry out this experiment and to have an experimental plant built outside this cook-house to receive the flow from the sullage water pipes.

The Garrison Engineer allowed us the services of the S.D.O. to carry out the construction, and his workshop's superintendent helped considerably in trying out the tipping tank for the automatic dosing.

¹ Hattersley, S. M., "Disposal of Waste Water," JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, vol. xlv, No. 6, June, 1935, pp. 402-404.

There was considerable difficulty at first in obtaining supplies of ferrous sulphate. The local chemist's ideas on the subject consisted in trying to produce the purified article, such as would be used in a chemical laboratory, and in quantities of one or two pounds at a time. The Supply Officer could not compete at all. The Ordnance Department showed ferrous sulphate in their list at 56 rupees (say £4 5s.) per hundredweight, or 8 annas per pound. This seemed somewhat exorbitant, seeing that Hattersley had quoted the English price at about 6s. to 7s. a hundredweight. However, the matter has now been settled satisfactorily by arrangements made by the Deputy Director of Hygiene, by which the ordnance list price is Rs. 4/5/- per hundredweight.

The drainage on which the apparatus was to be tried out consisted of two outflow pipes, an upper one which discharged from the kitchen sink, a lower which discharged the drainage from the floor. The latter led directly to the outside drain and was only some twenty inches above the level of the ground outside the cook-house. It was found essential to include the flow from this lower drain if all the sullage water from the cook-house was to be treated by the new method. The reason for this was the habits of the Indian cook and his minions, who invariably prefer to dish up, wash up, and clean down everything on the floor rather than in the sink provided for the purpose. These two outflow pipes have therefore been linked up into one common pipe which discharges directly over the apparatus. The result has been that the whole apparatus has had to be fitted into a height of some twenty-four inches to allow flow of the effluent to the existing drain.

In other circumstances, particularly where underground disposal of the cleared effluent might be contemplated, a greater depth could be arranged with consequently better sedimentation in the settling tank and more latitude in the dimensions of the mixing tank and the apparatus for automatic dosing.

The apparatus is shown in diagrams which indicate clearly the methods employed ; and can be briefly described as follows :—

A mixing tank is built of brick or reinforced concrete and lined with a smooth cement surface. The bottom is sloped from the proximal end to the exit, and grooved and dished down to a two-inch drain at the lower end. At the upper end of the tank is a broad ledge on which are placed the two solution tanks—one for ferrous sulphate and one for lime.

There is no need for these tanks to be fixed in any way and construction is simplified if these are plain galvanized metal boxes resting in the required position on the ledge.

Fixed firmly to the bed of the tank are two metal brackets to support the tipping tank with its two arms to carry the dosing cups into the solution tanks.

The tipping tank may be fixed in this manner or may be fixed in the lateral walls of the mixing tank, but the present method ensures that the

whole tipping and splashing arrangement is within the confines of the mixing tank, and allows ready removal of the tipping tank for repair or alteration by undoing four bolts.

The tipping tank consists of a galvanized metal box with a capacity of four gallons made with a sloping, curved bottom and fixed on a swivelled axis and so balanced that when completely filled with liquid it automatically tilts over and empties the whole contents into the mixing tank. An adjustable counterpoise weight is fitted on a rod fixed to the back of the tank to ensure this action and the return to the resting position when empty.

The bottom of the tipping tank is sloped in a gentle curve from the back up to the front edge to allow the semicircular swing required for emptying and to ensure that all the contents are discharged.

Two arms are also fitted at each end of the tipping tank, on each of which is fixed a small metal dosing cup with a capacity of eight ounces. The shape of the cup has to be the same as that of the tipping tank in order to ensure complete emptying. The arms are curved so that each cup is carried down into its respective solution tank when at rest. A small hole is drilled in the base of each dosing cup to allow the cup to fill, particularly when the level of the dosing solution is becoming low in the solution tank.

The solution tanks are made with a capacity of 2 and $2\frac{1}{2}$ gallons for the ferrous sulphate and lime solutions respectively. This allows a real working capacity of $1\frac{1}{2}$ and 2 gallons owing to the waste depth at the bottom of the tank due to the depth of the dosing cups. Dished down solution tanks were contemplated, but they would have been more expensive and much more difficult to fit into position.

When the tipping tank fills to the brim, it tilts over on its swivelled axis, emptying its contents into the mixing tank; the arms swing upwards carrying the dosing cups, which in turn shoot their contents of lime and ferrous sulphate solution forward into the sullage as it surges up and down the bottom of the mixing tank.

The sweeper in charge merely has to fill the solution tanks with the amount of dry ferrous sulphate or lime, which he has been told to use. The common cigarette tin forms a very useful measure for measuring out the necessary quantities, as the dosage is approximate and not exact. The effluent varies at different times of the day and the object of the dosing is to obtain alkalinity plus a sufficiency of ferrous sulphate to form the floc. This method of measurement and dosing is found to give sufficiently accurate results to produce a good floc throughout the day.

The beauty of the method is that anyone can tell at a glance whether the dosage is sufficient. Directly the dose of ferrous sulphate is sufficient and alkalinity is obtained, the greenish-grey floc separates out leaving a clear supernatant fluid and all trace of greasiness disappears. If there is greasiness or the water does not appear clear between or above the sediment then alkalinity has not been obtained. As Hattersley points out, there is

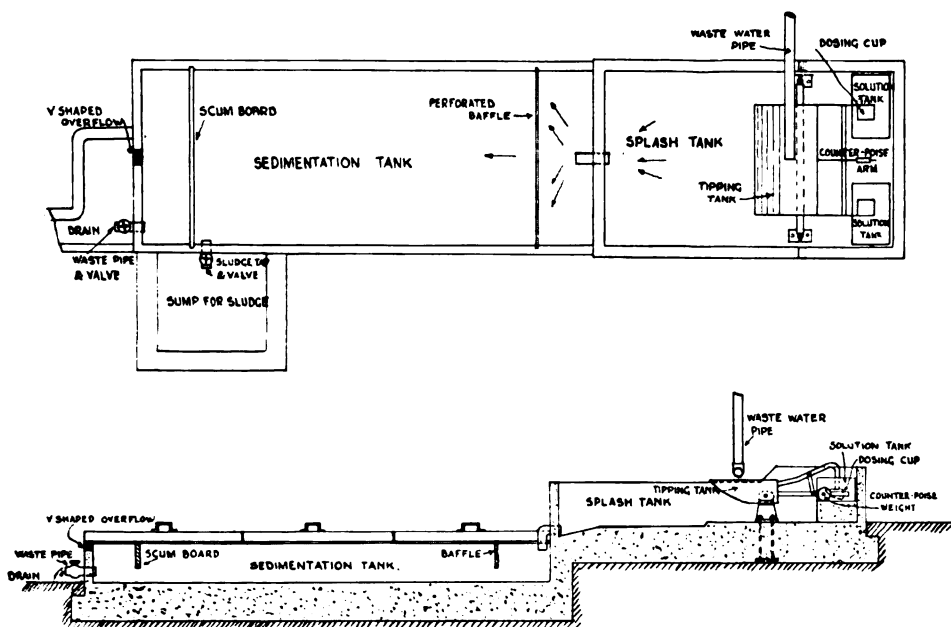
no need for chemical tests for alkalinity with phenolphthalein once the individual in charge has seen the correct result. A glance is sufficient to decide whether dosing is correct or not.

Testing with phenolphthalein is, however, not only useful in the early stages to get the right dose, but also to show the man in charge exactly the appearance required for correct dosing.

There is a considerable amount of splash from the solution tanks when the cups fall back to their position of rest. This, at present, is inevitable and would necessitate raising the height of the back wall in any locality where external splashing had to be avoided.

Sedimentation.—The rest of the plant consists of a simple sedimentation tank, which is provided with a baffle plate, scum board and sludging tap.

The inflow pipe is curved down towards the bottom of the tank and a perforated metal plate is fixed one foot from the end to break the flow. This plate is clear of the bottom (*see diagrams*). The scum board is loosely



fixed in grooves in the lateral walls one foot from the outflow end. It has a depth of only six inches.

The outflow is given by means of a "V" shaped notch discharging into the final drain.

Discharging into this same drain is a small tap placed three inches above the base of the tank to drain off the supernatant water, when cleaning is required.

Placed laterally at the base of the tank is a two-inch sludge tap,

discharging over a sump in which a receptacle for collection can be placed. Ample room must be allowed for manipulation of the receptacle.

The base of the sedimentation tank must be absolutely smooth cement, sloping down from the inflow end, with a dished channel leading down laterally from the centre to the discharging sludge pipe.

In the present plant a drain from the sump to the main drain was made. This is not required and is actually an incentive to the sweepers to flush all the contents of the tank down the disposal drain. Under normal circumstances in any new construction these open drains would be replaced by covered drainage leading to underground disposal. The effluent is perfectly clear and free from grease and would soak readily in any ordinary garden soil. This method, therefore, offers a satisfactory way of disposal for all the sullage water drainage from separate barracks or officers' or other type of quarters. The only requirements will be supervising personnel who understand what the process is and the appearance of the correctly treated sullage; and secondly a supply of commercial ferrous sulphate and lime. The amounts required and the cost will vary slightly with the nature of the sullage and the locality, but the materials are cheap. The dose used in the present instance has to be as high as 40 grains per gallon and the daily flow is about 120 gallons.

The tipping tank has a capacity of 4 gallons with dosing cups of 8 ounces, and solution tanks are 2 and $2\frac{1}{2}$ gallons so that they will cope with approximately one day's output with one refilling of the solution tanks.

[My thanks are due to Mr. C. J. Todd, the Assistant Surgeon at the District Laboratory, Rawalpindi, for his assistance and supervision of the personnel concerned and to Mr. J. B. Pearce and Mr. Habibullah, the Sub-Divisional Officer and Workshop Superintendent, respectively, of the Engineering Services, who so willingly experimented on and carried out the construction of the apparatus.]

MEDICAL SPECIALISTS' MEETING.

(Continued from page 48.)

DISCUSSION ON ANXIETY STATES.

BY DR. ALDREN TURNER.

FROM the summer of 1919 to the present time between thirteen and fourteen hundred officer neurological cases have come before the War Office Medical Board. Of these, approximately five hundred, or rather more than 30 per cent, were functional cases illustrative of the anxiety-neurasthenic syndrome. The diagnosis of "anxiety neurosis" is of relatively late introduction, but a survey of the cases labelled as "neurasthenia" shows a large number with a strong anxiety colouring. The psychoneuroses (anxiety states, neurasthenia and hysteria) may therefore be regarded as the common type of functional nervous disability observed amongst serving officers.

It is readily understood that the serving soldier is especially exposed to many conditions favouring some form of nervous exhaustion or disability. Many of those who suffered from a war neurosis made a complete and lasting recovery.

On the other hand there were cases who recovered, but in whom some degree of nervous instability was induced by the strain of war experience, and who, after a variable period of general duty, suffered a relapse of psychoneurotic symptoms from special stress, such as a return to duty under the conditions of foreign service, an infective illness or a cerebral concussion.

Psychological experiences also of an adverse kind peculiar to military service and to Army life were common causes, but in many instances the upsetting circumstance was found in domestic, financial or economic worries.

It is almost impossible in this category of patient to exclude as contributory factors the secondary effects upon the officer's mental outlook of minor head injuries, lesser degrees of concussion, spinal and other traumata, which for one reason or another, favour symptoms of an anxiety type. Chief amongst these reasons may be found anxiety as to the officer's fitness for further service, his future military career, permanent incapacity and considerations over pensions.

The cases of psychoneurosis which have come before the Medical Board may be grouped into three main categories according to the dates when first observed :—

(1) Cases presenting the symptoms of a war neurosis. These ceased to be observed after 1922 and 1923.

(2) Cases in whom recovery from a war neurosis had been succeeded by several years of general duty at home or abroad and followed by a relapse. These cases were observed mainly during the period 1920 to 1930.

(3) Post-war cases—officers who joined the Army subsequent to the War and who developed a neurosis under Service conditions or in circumstances unconnected with military life.

The *causes* determining a psychoneurotic breakdown are numerous and in the main are psychogenic, as it is generally accepted that the neuroses are mental reactions to situations of stress and are evidence of a failure of individual adjustment. Some of these causes are peculiar to military service. Amongst the more commonly observed were adverse confidential reports and passing over for promotion. Others were the occupation of a position of responsibility which the officer felt he was not competent to hold, and the effects of isolation in a frontier post.

Causes common to military and civil life were overwork and worry, either in association with ordinary duties or failure at important examinations; but most common of all, domestic, financial and marital troubles and anxieties. The thwarting of normal urges by the breaking of a marriage engagement accounted for a number of cases.

Although the mental factor is uppermost in the causation of psychoneurotic illness, the contributory influence of physical causes, such as fatigue, fever and debilitating conditions should not be overlooked. Amongst the more important, in the long list of infective illnesses, which prepare the ground for the neuroses, were malaria and dysentery. Few cases indeed who had served abroad escaped one or other of these infections.

Amongst other disabilities, the "chronic appendix" would seem to play an important role, as its removal was the starting point of recovery in quite an appreciable number of cases. Tonsillar infections, pyorrhœa and hæmorrhoids occur in a sufficiently large number to make reference to them of some interest.

Old wounds and other traumata of the abdomen would seem to have some influence in the causation of anxiety. Long and continuous service in India, the East and the Tropics, whether there is a history or not of recurring tropical illness, appears in so many cases, especially in officers of more mature years, that it is not possible to disregard its importance as a predisposing cause of an acquired kind.

It is difficult to make specific statements as to the distribution of the cases. As might be expected India supplies the greatest number of officers invalided on account of the psychoneuroses. Nigeria and the West African Coast provide a relatively considerable number. In this region there would appear to be conditions of climate or of service peculiarly favourable to their development.

Alcohol plays little part in causation. A tendency to temporary excess is noted in some cases, but it would seem as if this was an early symptom of the disability—a "means of escape" rather than an ætiological factor.

The neurosis usually *commences* during a period of nervous strain from fatigue or overwork. The officer finds that his sleep may be disturbed by unpleasant dreams, or that he may wake so early that the amount of sleep is insufficient. In some cases there may be a difficulty in falling off to sleep, but in all some interference with sleep is an early and important symptom and one that deserves attention.

Along with this comes a tendency to worry over trifles, a lack of self-confidence, impairment of memory and of concentration and inability to make decisions. The picture of anxiety becomes aggravated when headaches and vague or annoying sensations in the head come on. With increasing depression, asocial feelings, dreads and phobias of various kinds (fear of disease, claustrophobia, etc.) develop, and with them a sense of incompetency and inferiority. The patient's mental outlook is now one of great distress, agitation and anxiety, and underlying it, but rarely divulged, is a fear of mental breakdown and insanity.

There may be periods relatively free of anxiety, and the tendency is towards recurring waves of mental depression. The clinical picture being that of increased emotionalism, physical signs accompany the mental distress, such as tremors, especially of the outstretched hands, eyelids and tongue, exaggeration of the deep reflexes, more particularly of the upper limb and tachycardia. Loss of weight also is a common accompaniment. Undue fatigability, both mental and physical, is always present.

Although many of the symptoms of this condition are those of hyperthyroidism there has been a striking absence of enlargement of the thyroid gland and no case of exophthalmic goitre has been observed.

The *outlook* for recovery is good, provided the patient is taken from duty and the circumstances contributing to the breakdown removed or satisfied. In most cases a return home from abroad is sufficient, but some require a short period of special care in Hospital or Convalescent Home. Although symptoms would seem to persist without change for some time, once improvement begins, recovery is rapid. The majority are able to return to duty in from six to eighteen months.

A number of cases of a less favourable type tend towards *chronicity*. In these the constitutional factor is usually prominent, being revealed either in family history or in personal characteristics of temperament and make-up. A few show an association between anxiety and organic disease, while in a small percentage only, the anxiety-neurasthenic syndrome is the forerunner of a psychotic illness. Unfavourable features are marked tremor of the tongue and persistence of mental depression.

In the recurring or relapsing type, a constitutional nervous weakness, which may be either inherited or acquired by illness and long service, is mainly responsible for the varying emotional reactions to overwork, worry, infectious diseases or service conditions either at home or abroad.

DISCUSSION ON ANXIETY STATES.

BY MAJOR J. BENNET,
Royal Army Medical Corps.

IN the ordinary course of my duties as a Medical Specialist I come a great deal into contact with cases of neurasthenia, anxiety neurosis and hysteria, and the problems these cases present form by far the most

difficult part of the day's work. We are concerned here with anxiety neurosis, a group of cases frequently easily distinguished from neurasthenia and hysteria by signs of sympathetic over-activity in varying combination and degree, and, in the mental sphere, by a tendency to worry, often by preoccupation with symptoms, and inability to concentrate. In cases of tachycardia a definite phobia or more vague fears, apart from those engendered by the diagnosis "D.A.H." if this appears on the diet sheet, often warrant a diagnosis of anxiety neurosis when otherwise this might be open to dispute.

The first essential in dealing with a case, as in dealing with others, is to get a full and accurate history, the development of symptoms being traced in relation to the varying circumstances in the patient's life history over the period preceding and covered by the illness. This is even more important than in most other diseases because the sympathetic listening it involves forms an outlet for at least some of the visceral hypertension which underlies the condition of anxiety, morbid or otherwise. The patient often has great difficulty in obtaining a sufficient hearing and this may aggravate his condition. The Army medical officer is confronted by a difficulty in that he has no post-graduate training in psychopathology, and frequently feels that he cannot assess the importance of common types of experience which figure as determining or aggravating factors in the condition presented to him, and I think it is a pity that facilities for the instruction of all officers in psychopathology as commonly encountered in military life do not exist. It is common knowledge and quite true that in assessing the role of mental experience we have to consider that remote incidents in the patient's life, long forgotten and repressed, may have given rise to conflicts which it requires a skilled psychotherapist to show, but we should not be dissuaded by this from making a thorough search for recent mental experiences of a causal nature. We shall often be successful, and although we may not achieve a full understanding of the neurosis, we shall be able to translate the symptoms into terms of anxiety which is the preliminary phase of any treatment.

The case-taking of many of these cases provides much of human interests.

Case 1.—I saw a Regimental Serjeant-Major just over a year ago who had been invalided from India as a case of neurasthenia. His mental disability, inability to concentrate, and preoccupation with uncomfortable sensations arising in his perineum, was very great. Three months in hospital, during which he had certainly much occupational therapy, amending books of regulations, but in addition considerable rest, had not led to much improvement in his mental health when I saw him. He had been in the Jalapahar earthquake of 1934, and, as his health had broken down shortly after this, the experiences he had undergone during a week's very trying time were regarded as contributory to his breakdown. I questioned him closely about these and could find nothing likely to have any bearing on the genesis of his neurosis. Carrying on from this point in

his life history it transpired that shortly after this he had failed while in a position of trust. His unit was quartered in rush-matting huts in Bengal and these were, at that time, frequently threatened with upheaval by prevailing storms of very sudden onset. The officers were quartered in a house over a mile distant, and the Regimental Serjeant-Major was frequently solely responsible for dealing with sudden emergencies arising from a threat of a storm. It was his duty on seeing clouds rapidly forming in a certain quarter to order the guard to sound an alarm, on which the troops had to get out of the huts and certain details had to reinforce the guard over the ammunition. After a period of many false alarms conscientiously made he took a risk one day in not turning out the troops when the appearances in the sky warranted his doing so. The storm struck the encampment this time, swiftly and suddenly, and troops who should have been elsewhere were entangled in the rush matting of the overturned huts. He was not censured either overtly or otherwise, and the attitude of his Commanding Officer afterwards seems to have been that the difficulty in deciding what action to take would have taxed the soundest judgment, and might have found it wanting. When the patient was subsequently invalided his Commanding Officer put himself to some trouble to ensure that he should be returned to the battalion when fit for duty, and wrote a personal letter to the O.C. Royal Victoria Hospital, Netley, in which he referred to the patient as an invaluable warrant officer. Shortly after the storm incident the patient developed tinea cruris. This was rapidly cured, but the mental trouble started, and when it was fully established he complained also of constant discomfort in the perineum, to account for which no objective change could be found. Listening to the patient's account of his life at the time one got an impression that the incident of the storm was charged with much more emotional tone than any experience he had had in the earthquake. I think I was justified in deciding that a sense of guilt, a common cause of morbid anxiety, was the cause of his condition, rather than any of his earthquake experiences. I think definite improvement leading to final fitness for duty started from the time his reactions to a repressed sense of guilt were openly discussed with sympathy and encouragement. In his case some of the visceral hypertension associated with the repressed anxiety appeared to find an outlet in the recrudescence of symptoms of tinea cruris after the original infection had cleared up, the condition which has received the separate name of "anxiety hysteria."

Underlying anxiety neurosis and what we must try to assess in every case are three factors :—

- (1) An innate or acquired inadequacy or inferiority.
- (2) Some situational difficulty making a demand on the inferior organ,
and
- (3) The resulting conflict in the patient's mind if the situation cannot be dealt with satisfactorily.

A careful case-taking often clears up an otherwise obscure case and brings out the points at issue at once. This is well illustrated in a case I examined last week.

Case 2.—Lance-Corporal J., The Irish Guards, aged 20. Service, one year. Sent to hospital complaining of a “weak stomach”; could not eat his breakfast and had a poor appetite for other meals. Complained also of palpitation, and slight shortness of breath on exertion: pupils dilated; pulse 88; systolic blood-pressure 135; gastric investigation negative; lungs, no evidence of tubercle. P.M.H. occasional dizziness and morbid fears that he would not be able to stand still on parade at the depot. Personal circumstances: keen on the Army, but would have rather been accepted for the R.A.F., for which he was turned down; very conscientious; created almost a record for promotion to Lance-Corporal in his regiment, receiving his stripe after seven months’ service. On reading the order in which his promotion was published suffered from palpitation and tremors noticed by his fellows near at hand. Palpitations have persisted since and dyspnoea on exertion has become noticeable. He is still deemed by his superiors a very efficient young N.C.O., although he confesses to timidity in the matter of throwing his weight about.

To sum up, this patient is inadequate for the situation in which he finds himself, and so far has been unable to rise above it. Symptoms are an expression of fear that the situation will be too much for him. He shows a very clear picture of anxiety neurosis at present, and illustrates the three factors mentioned above very well; but after a long talk with him one is left with the impression of mental inaccessibility; he is difficult to “get at” and confides little. Most true anxiety cases are the reverse. When he tells us that he has few interests apart from his work, seldom going out with his fellows, spends most of his spare time sitting on his bed polishing, or frequently simply sitting on his bed doing nothing, we entertain fears that his anxiety neurosis may be a prelude to a breakdown of a more serious type. I will refer to this case again presently.

What I mentioned above about the factors underlying an anxiety state requires some modification. We must accept as cases of anxiety neurosis some in which the factor of inadequacy is minimal and the urgency of the situational difficulty maximal, or the emotional conflict is severe and prolonged.

A common example of this in the Army is found in the young soldier, married off the strength and not entitled to quarters, who makes a start at getting a family together. We had a case in the wards some months ago in whom the onset of tachycardia, dyspnoea on exertion, and tremors appeared to be related in time to situational difficulties of this sort.

Case 3.—Lieutenant C., I.A. Corps of Clerks.

Invalided twice from India in the course of eighteen months commencing April, 1934, complaining of inability to concentrate and pre-occupied with symptoms of indigestion for which no organic cause could be found.

He had had an invalid bedridden wife to attend to since 1932, in addition to his own arduous duties, which involved much mental strain and confined him indoors practically all day. His wife died in April, 1936, and in July, 1936, he had regained normal health. When seen early in September, 1936, on completion of his second honeymoon, there was little trace of inadequacy or inferiority in his general bearing and outlook on life.

Case 4.—Major B., I.A.

Invalided from India October, 1935, showing emotional instability, inability to concentrate, and pre-occupied with various symptoms which need not be enumerated. History of insidious onset. On examination was querulous and mildly elated, and showed marked tremors of the face, hands and tongue. At other times was subject to depression. His wife had been deteriorating mentally for the previous five years, and her condition had been diagnosed as dementia presenilis. Normal emotional control established after six months' rest in a nursing home. Duration of absence from duty on account of disability, eighteen months.

Cases 3 and 4 are more satisfactorily classified as exhaustion states or neurasthenia.

In considering the three factors I have mentioned, we must remember that inadequacy may be required in a more or less normal individual as a result of infection and toxæmia. The question of focal sepsis has been systematically investigated in the cases under treatment at the Queen Alexandra Military Hospital, but I cannot say that we have observed much improvement in mental health as a result of removals of teeth and tonsils. Needless to say, we continue to advocate these measures when the condition found on examination calls for them. In one case recently under observation and which I shall refer to later, and in whom an infected antrum was drained, the diagnosis of anxiety neurosis was open to question.

I mentioned that the average Army medical officer's lack of post-graduate training in psychopathology handicaps him in case taking. Such factors as fear of bodily illness and dread of insanity and the mental conflicts associated with masturbation, however, are very easy to assess. They are all very common. I have seen two cases of severe anxiety neurosis recently in young soldiers in whom mental conflict associated with masturbation was very prominent. In these cases it is the conflict that causes the symptoms, not the act *per se*.

Case 5.—Trooper A., aged 22 years. Service two years nine months. Admitted to hospital September 21, 1936, complaining of attacks in which transient loss of consciousness occurs and associated with subsequent loss of memory for about ten minutes. On one occasion while on mounted exercise his horse fell out of the ranks, crossed a pavement and started to chew leaves on a hedge. He remained mounted apparently oblivious to what was going on, and when subsequently charged with irregularity knew nothing about it. Duration of attacks eleven years, but no apparent memory loss or automatisms until three months ago; frequency about two

per week. Complained also of constant worry: the thought of going on night guard worried him for days beforehand. Had become unpopular in the barrack room because the noise got on his nerves and he would frequently shout at others to keep quiet.

A sister had a severe nervous breakdown at the age of 25, and was in hospital for six months.

He was first considered to be a case of *petit mal*, but as a result of routine examination mental conflict in connexion with masturbation was disclosed. He had practised this since the age of 9, and at about that age was discovered by his mother in the act. She told him it would "ruin his health and sap his brain." The exact words were remembered clearly. Attacks simulating *petit mal* started at the age of 12, and when he mentioned them to his mother she said "That's your old habit." Masturbation had been practised to excess up to the age of 18, and had only been given up six months prior to admission. The conflict in his mind in connexion with it and his morbid fears as to its possible effects were very severe. He appeared to dread his mother's getting to hear of his disability.

The other case, a boy, aged 18, presented the usual physical and mental signs of morbid anxiety in severe degree. He stated that he had been told by a padre some years previously that the habit of masturbation caused insanity, but that he had not been able to give it up, although he had dreaded insanity on this account.

The interpretation of the patient's statements in the case-taking may require some knowledge of the common mental mechanisms. A simple extended exploration of the life situation, however, may explain a good deal.

I saw a recruit at Netley from one of the depots at Winchester who alleged a phobia for loud noises. It could be shown that he was quite tolerant of loud noises. He had joined the Army at the age of 27, had been a labourer and was particularly slow and clumsy in his movements. Inquiry showed that he was the laughing stock of a squad of recruits much younger than himself in a gymnasium. The fear of this had become intolerable, but he preferred to express his anxiety as a fear of loud noises.

THE DIAGNOSIS OF ANXIETY NEUROSIS.

On the physical side we look for signs of sympathetic over-activity in varying combination and degree, and on the mental side for interference with function of the highest mental level, loss of power of adaptation, inability to concentrate, pre-occupation with symptoms, and evidence of decontrol in the form of manifestations of fear.

We had a case in the wards recently of a senior warrant officer who had been in and out of hospital for over a year diagnosed neurasthenia or anxiety neurosis, and had recently been invalided from India on the latter account. The question of neurasthenia did not require much consideration, as he could play and enjoy eighteen holes of golf and his handicap of ten had not gone down in the course of his illness. He did mention that he felt a bit tired if he attempted thirty-six holes. He certainly showed marked pre-

occupation with certain symptoms which appeared neurotic, but he had no signs of sympathetic over-activity. His blood-pressure was 110 and he had no tremors. In the course of routine investigation a collection of pus was found in one antrum. There seemed a strong probability that there was no element of morbid anxiety in this case at all although his domestic circumstances had been very adverse to him for some years.

Dr. Mapother states in one of his writings that "morbid fatigability and hyperactivity of the mechanism of fear form the primary departure from the normal in nearly every psychosis, organic or functional."

This makes us pause to consider whether the case of Lance-Corporal J. (Case 4) which I quoted in detail is not the early stage of a more serious breakdown. His inaccessibility is very marked compared with the ease with which the conflicts in connexion with masturbation in the mind of Trooper A. (Case 5) are laid bare, and there is the history of dulling in the emotional field, doing nothing in his spare time frequently but sitting on his bed.

Many cases typical of the syndrome known as D.A.H. show, in addition to the physical symptoms and signs, vague or more definite phobias. This applies to about half of the few cases of this kind I have seen in the past six months in serving soldiers. The mental and nervous factors associated in these cases are discussed by Lewis in his book "*The Soldier's Heart and the Effort Syndrome*," published in 1918. Perhaps if an equally thorough investigation could be carried out at the present day in the light of advances in our knowledge of psychopathology and of its more general application, the rôle of nervous inadequacy or inferiority would be considered more definitely causal in the production of symptoms than was attributed to such factors in 1918. At present we only see occasional cases that have either not been sufficiently severe to warrant rejection on enlistment or have arisen afterwards. Some of these in young soldiers appear to be cases of adolescent instability, temporary disorders associated with demands made on inferior organisms by growth and development and by the coming into play of new or reinforced internal secretions. Others may be due to mental conflict, as the barrack room environment requires a healthy, robust mentality for satisfactory adaptation and readily reveals any inadequacy or inferiority. In other cases of D.A.H. we find physical factors such as recent infection; I do not suggest that in all cases the primary cause is mental.

A distinction between neurasthenia and anxiety neurosis is perhaps necessary from the point of view of treatment. Exhaustion and heightened fatigability tend to replace subjective and objective manifestations of fear. More important problems arise when the reactions of a case of anxiety neurosis become purely hysterical. In the milder cases we frequently encounter vague states with alleged amnesia covering a period in which some delinquency occurs, such as failing to report for duty on completion of leave. I think we must regard these cases as hysteria.

TREATMENT.

Much benefit accrues from a thorough examination, including all the accessory methods of investigation at our disposal and a thorough search for focal sepsis. We have to be careful to express no opinion until this has been done. Explanation of the functions of each investigation are often necessary, particularly in a querulous type of patient, and the significance of negative results carefully explained. In all cases of genuine anxiety states we must avoid remarks to the effect that the symptoms are imaginary, and in all genuine cases we must give the patient a full hearing. We must assure the patient that we realize how real the illness is to him, and then set about to try and explain to him how the symptoms have arisen if we can, and as tactfully as we can, in the hope that some emotional adjustment will follow. If we cannot, we must give the patient all the sympathy, reassurance and encouragement at our disposal and carefully avoid conveying any impression that we are tired of him and his illness.

I think that the lack of training in psychotherapy is a handicap, the importance of which many tend to over-assess. After all, most of us have a knowledge of life in its broadest sense which is probably more important, and methods will suggest themselves if we are willing to spend what time we can talking to the patient about his life and symptoms.

I do not consider that we see many cases of anxiety neurosis who require the more elaborate methods of psychotherapy.

As regards the milder cases showing the D.A.H. group of symptoms, often associated with vague phobias, we keep them at duty. Perhaps we thereby lay in a store of trouble for the Commissioners of the Royal Hospital, Chelsea, but we try to cut down our list of proposed invalids as much as possible. The more severe cases of this type have to be invalidated. In these I must confess that investigation of the life situation by the simpler methods of mental exploration have neither thrown any light on their symptoms nor led to any improvement. It is very disappointing. I asked Dr. Mapother the other day if he thought these cases could be rendered fit for service by psychotherapy. His answer was "No."

When the reactions of cases of anxiety neurosis become frankly hysterical we ought to take up a much firmer attitude than we usually do. We have obviously to omit the sympathy and encouragement. As it is in the milder cases that alleged amnesias are most frequently seen we should probably regard them as hysterics from the beginning, but as I have tried to confine these remarks to cases that have struck me as genuine cases of anxiety neurosis, I shall not pursue the subject further.

Clinical and other Notes.

A CASE OF PRIMARY CARCINOMA OF THE LIVER.

BY LIEUTENANT-COLONEL C. M. FINNY, O.B.E.,

Royal Army Medical Corps,

AND

CAPTAIN L. R. S. MACFARLANE,

Royal Army Medical Corps.

THE following case seems to be worth publishing on account of its rarity in one so young.

Though its interest is largely for the pathologist, it also serves as a reminder that, even in these days of specialization and laboratory examinations, diagnosis can still rest on simple clinical examination.

Private L., aged 21, was admitted to hospital on July 31 for investigation on account of vague attacks of abdominal pain since June with occasional passage of blood per rectum.

He stated that his previous health had been good. His general appearance was healthy; he was well nourished, there was no anæmia, he had a clean tongue and good appetite.

A barium meal showed no intestinal abnormality and no cause for bleeding was discovered on rectal examination.

Palpation of the abdomen, however, revealed a firm swelling with an irregular margin which moved on respiration in the left hypochondrium. The lower margin of the liver was also enlarged on the right side. The tumour in the left side of the abdomen was considered to be probably the spleen, and this was supported by a differential blood-count, which showed 18 per cent myelocytes. The total white cells were 15,000 per cubic millimetre.

August 13: No marked change. His temperature had occasionally risen above normal and at times he suffered from vague pains in the thighs. Wassermann negative.

August 30: An X-ray showed that the upper surface of the right lobe of the liver reached to the sixth rib in the scapular line, at least two inches above the left lobe. The lower border reached almost to the umbilicus, as also did the spleen.

A differential blood-count showed that the myelocytes had fallen to 4·5 per cent; total white cells to 10,000.

One of us, who had recently returned from leave, after studying the blood examinations was able definitely to exclude any form of leukæmia from the diagnosis.

September 4: The patient commenced to suffer from attacks of abdominal

pain. These occurred in different places, but were more frequent in the right side and flank, and were induced by lying on the left side or extending the spine.

The liver had not appreciably enlarged, but was firmer and more easily felt. It was now apparent that what had been taken for an enlarged spleen was in reality a downward prolongation of the left lobe of the liver.

He still had a clean tongue and good appetite and as a rule slept well ; but a diagnosis of carcinoma of the liver seemed the only one to account for his physical signs. Though at first tentative, his subsequent course soon made this diagnosis a certainty. The superficial abdominal veins enlarged, he had difficulty with his bowels, passing small quantities of blood and mucus, and the frequency and severity of the pains increased, so that by September 9 he needed morphia $\frac{1}{4}$ grain twice daily.

Emaciation rapidly set in and bosses could be felt on the liver which was by now very tender. Jaundice did not occur until September 20, and on September 26—less than two months after his admission as an apparently healthy man—his troubles were at an end.

Autopsy.—On opening the body the liver was at once seen to be enormously enlarged. Besides descending to the level of the umbilicus it extended upwards to the 3rd intercostal space on the right side and on the left side to the 5th interspace. It was studded with stained tumours but presented no signs of cirrhosis. The lungs were collapsed and the heart pushed upwards and forward. The liver was then removed and found to weigh seventeen pounds.

On further examination no primary focus could be seen anywhere in the body and no secondary growths could be discovered.



The liver, as stated before, was studded with tumours, no one of which could be said to be primary with regard to the others. These tumours were mostly firm and bile stained, but many already showed marked degeneration and softening. The gall-bladder and bile-duct were not involved. No cirrhosis was present. The picture was one of primary carcinoma of the liver.

On cutting and staining microscopic sections the appearance was that

of adeno-carcinoma. The tumour cells showed great anaplasia and mitosis was seen, indicating a very active malignancy and in our opinion the type was of the "liver-cell" rather than "bile duct" variety.

Primary carcinoma of the liver is at all times rare, but especially in one so young. It is divided into two varieties by most authorities—the bile-duct cell adeno-carcinoma and the liver cell adeno-carcinoma.

In the former case the carcinoma originates in the columnar or cubical lining cells of the intrahepatic bile-ducts. In these cases there is no cirrhosis and as a rule no bile staining of the tumours. Secondaries are nearly always present and it is the rarer of the two types.

The liver-cell type generally follows on cirrhosis of the liver but according to Muir may occur without this. Secondaries are rare and the tumours are bile stained. McCallum supports Muir in this description.

In this case the macroscopic features favoured the latter group and in the sections a definite resemblance to liver cells was noted in the tumours which were least degenerated. In the degenerated tumours anaplasia and the degeneration made it difficult to distinguish the cells of origin.

Whether the cells originated from liver cells without previous cirrhosis or from epithelium lining the bile-duct, the condition is rare and sufficient excuse for publishing the case.

A further point of interest on the clinical aspect is the question of pain. During the last few weeks of his life the patient suffered much pain—morphia $\frac{1}{4}$ grain had to be given four times a day—and yet during his stay in hospital the size of his liver did not increase much. On admission both lobes of the liver reached almost to the umbilicus. One would have thought that the enlarging of a normal liver to this size would have been painful, and yet he had carried on with his duties with comparatively little discomfort for weeks if not months while his liver was doubling its size.

Our thanks are due to Private G. K. Smith, R.A.M.C., for taking the photograph of the organ after removal.

AN IMPROVISED APPARATUS FOR THE ADMINISTRATION OF ETHYL CHLORIDE AS A GENERAL ANÆSTHETIC.

BY CAPTAIN A. MACDONALD,
Royal Army Medical Corps,

AND

2ND CLASS ASSISTANT SURGEON R. DORLING,
Indian Medical Department.

THIS description of a simple, improvised apparatus for administering ethyl chloride for general anæsthesia is offered on account of the ease with which it can be put together out of readily obtainable materials and the success which has attended its use in some eighty cases observed.

The necessary apparatus consists of:—

(A) A face-piece of Gamgee tissue, in which a slot has been cut to admit the patient's nose and mouth.

(B) A Schimmelbusch's chloroform mask, fitted with four thicknesses of surgical gauze.

(C) A cylindrical wire frame about fourteen inches in height, fashioned from ordinary packing-case wire, so that the lower perimeter accurately fits the main frame of the Schimmelbusch mask.

(D) A covering, sewn firmly round the wire frame consisting of one layer of surgical lint and an outer layer of jaconet, in such a way as to allow a cuff of jaconet (E) to be invaginated about four inches into the frame at its upper end.

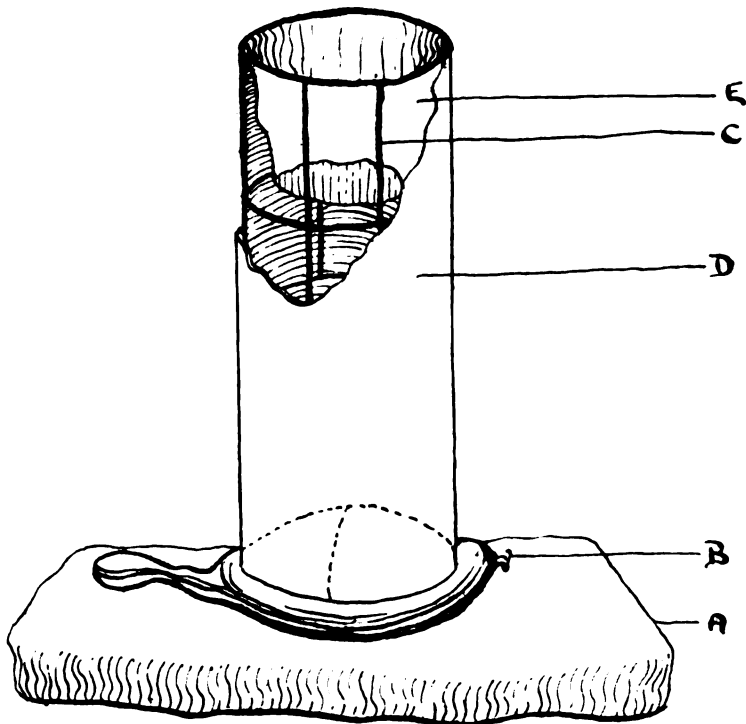


Diagram of apparatus cut away to show wire frame and cuff.

An ampoule of ethyl chloride, fitted with a spring nozzle, completes the necessary apparatus.

When in use the mask is fitted firmly into the frame by tapes fore and aft, so that the mask and frame can be easily controlled by the forefinger and thumb of one hand, whilst the other hand holding the ethyl chloride spray is passed into the cylinder, extraneous air being excluded by the cuff of invaginated jaconet.

The speed of induction is under complete control and in practice it has been found that from five to ten cubic centimetres of ethyl chloride so administered will give from two to four minutes of complete anæsthesia.

Recovery of consciousness is complete in a few minutes and no untoward effects have so far been noted.

Although it is impossible to be certain that similar appliances are not in everyday use, none such has come to our notice, and the apparatus described above has been arrived at by experiment from materials available to all.

The authors are indebted to Lieutenant-Colonel A. G. Wells, D.S.O., R.A.M.C., Officer Commanding British Military Hospital (with Indian Wing), Mingaladon, Burma, for permission to forward these notes for publication.

Echoes of the Past.

WAR EXPERIENCES OF A TERRITORIAL MEDICAL OFFICER.

BY MAJOR-GENERAL SIR RICHARD LUCE, K.C.M.G., C.B., M.B., F.R.C.S.

(*Continued from p. 65*)

CHAPTER XVIII.—THE CAPTURE OF SHERIA AND GAZA.

THE scheme for the second phase of the operation was as follows :—

The 53rd Division was temporarily attached to the Desert Mounted Corps whose commander became responsible for the protection of the right flank.

The 74th, 60th and 10th Divisions were to attack the Kauwukap trench system, placed in this order from right to left.

The 74th Division was to begin the operation by an attack on the extreme left flank of the enemy with one brigade making the direction of their attack parallel to the line of the trenches. The other two brigades were to be echeloned on the right flank to meet any counter attack from the north-west.

During the attack by the 74th Division on the trenches to the east of the railway the 60th and 10th Divisions were to move forward to cover suitable positions from which their artillery could make the preliminary bombardment of the Kauwukah system.

As soon as the 74th Division reached the railway, the 60th and 10th were to deliver their attack on the main position west of the railway.

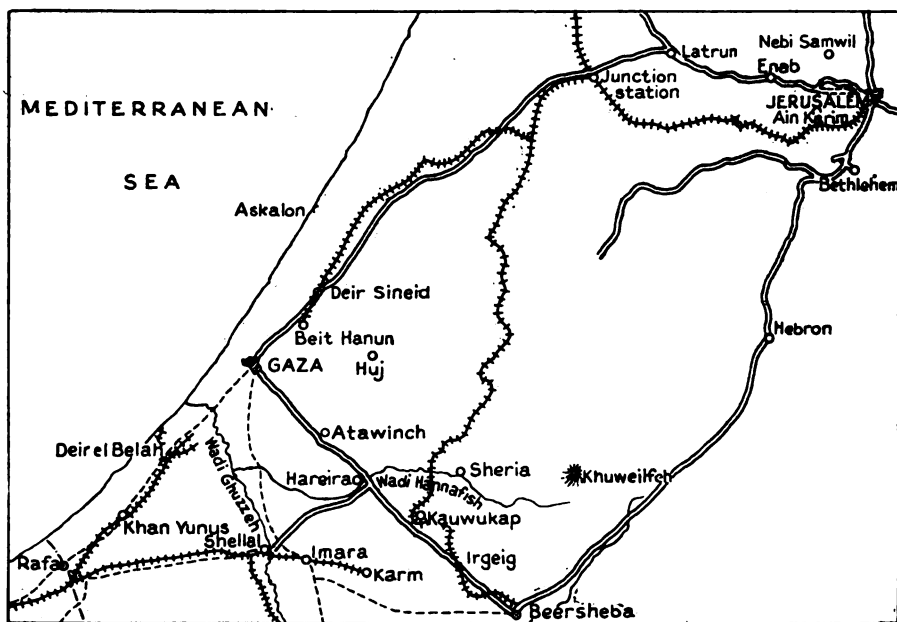
Only one brigade of the 10th Division was to be employed in the attack the other two being held in corps reserve.

Once the Kauwukap system was taken it was intended that the 74th

Division, assisted if necessary by the 60th, should push on northwards and secure the high ground to the north of Sheria commanding the water supply at that place.

The medical arrangements for this phase were as follows :—

The three casualty clearing stations and the Egyptian hospital remained as before at Imara.



It will be seen by a glance at the map that the Kauwukap system is nearer to Imara than Beersheba is. To evacuate wounded via Beersheba involved a journey round two sides of a triangle. The direct route was, however, little known ; it was directly under observation from Kauwukap for a good part of its length and it had not been possible to reconnoitre further than the Wadi Hannafish before the attack on Beersheba. This route was therefore explored in a motor car on November 4 and found practicable by crossing the Wadi Hannafish at Bir Imleh. The crossing required, however, some work on it to make it passable for motor ambulances, and for this purpose the R.E. detailed fifty Egyptian Labour Corps men. It was then arranged that this route should be used for evacuation from the 64th, 60th, and 10th Divisions.

Evacuation from the 53rd Division, now attached to the Desert Corps, was still carried on via the hospital at Beersheba to Imara, for which purpose the whole of the twenty-one motor ambulances were handed over to the Division. During the operation these were placed at the disposal of the A.D.M.S. who was responsible for the evacuation of the casualties right up to the casualty clearing stations. The seventeen motor

ambulances of the 35th M.A. Convoy attached to the 20th Corps were to assist on whatever route they were most needed.

Corps Headquarters remained at Beersheba during this phase.

The tracks east of the Gaza-Beersheba road were none of them suitable for motor ambulances ; it was therefore decided to bring casualties to the Gaza-Beersheba road by camels and sand carts, and from there on by motor ambulance. The 60th and 74th Divisions therefore placed sections of field ambulances on the road near Irgeig to act as transfer posts. The journey from the right of the 74th Division to Irgeig was a lonely and difficult one.

The 10th Division was able to evacuate across the Wadi Hannafish at Bir Ifteis in the later stages, and this further shortened the route.

The attack took place on the morning of November 6 as arranged. The 74th met with considerable opposition and had heavy losses, but eventually overcame the enemy's resistance and made their way to the railway. Once this was done the 60th and 10th made their attack on Kauwukap and took it without great difficulty. It appeared afterwards that this position had not been seriously held by infantry. When I examined the position next day there were few signs of the trenches having been occupied except by machine guns.

As the 74th had had a heavy fight and the 60th only a light one, by an alteration of the programme it was decided that the 60th should take over the work of attacking Sheria. After a rapid re-organization they moved north against this position. The Turks put up a strong resistance and the place was not finally taken until the morning of the 7th.

Meanwhile the work of evacuation was proceeding slowly. On the 6th it became obvious that there was going to be a considerable congestion of wounded on the Gaza-Beersheba road at Irgeig. It was, therefore, decided to move the 53rd Immobile Field Ambulance from Imara to that point. This unit arrived with all available tentage about seven o'clock a.m. on the 7th and took over the cases there, leaving the field ambulances of the 74th and 60th Divisions free to rejoin their divisions.

It was found impossible to get all the cases away from Irgeig direct by motor ambulance to Imara, so it was decided to make use of supply wagons and lorries returning from the divisions to Beersheba for light cases ; some hundreds were evacuated in this way and passed through the hospital at Beersheba. Lying cases continued to be sent by motor ambulances direct to Imara across the Wadi Hannafish.

On the morning of the 7th, the 60th Division was transferred to the Desert Corps which was now detailed to act as a flying column in pursuit of the retreating Turks. At the same time the 10th Division moved along the Gaza-Beersheba road and attacked Hareira, the next post towards Gaza on the Turkish line of defence. It was a strong natural position defended with numerous machine guns and supported by artillery, but it fell after a sharp fight.

The enemy's old flank was now broken and crumpled. They had, it is true, diverted a fairly strong force on to the Hebron road, but there was a wide gap between this and the still intact part of the Gaza defences.

The 21st Corps, meanwhile, had been putting increased pressure on Gaza itself. With their left flank now open to attack, the Turks decided to withdraw from the town. This they managed to do without immediate disaster on the evening of the 6th. The 21st and Desert Corps at once set out in pursuit. The 60th Division (attached to the Desert Corps) moved forward to Huj on the 9th, but it soon became obvious that they could not keep up with the mounted troops and they reverted to the command of the 20th Corps.

By instruction from G.H.Q. all available transport was now turned over to the Desert and 21st Corps to enable them to carry on the pursuit, and by the withdrawal of a large portion of its transport, the 20th Corps was left practically immobile.

The 74th and 10th Divisions were ordered back to railhead at Karm on the 9th, while the 60th remained for a few days in the Huj area to collect the prisoners and booty and then withdraw to Sheria. The 53rd Division, which had reverted to the 20th Corps command after the battle, still held a line covering Kauwukap and remained in touch with the enemy who held the Hebron road.

One hundred and seventy wounded Turks were found at Sheria and we had to send eight motor ambulances to assist Desert Corps in bringing them in.

CHAPTER XIX.—THE PURSUIT OF THE TURKS AND PREPARATION FOR THE ATTACK ON JERUSALEM.

At the end of the last chapter it was shown how the 20th Corps, by the removal of its mechanical transport, was left immobile. During the next fortnight, therefore, we took no active part in the operations except that the 53rd Division remained more or less in touch with the Turkish Force on the Hebron Road, north of Beersheba. The 10th and 74th Divisions were refitting at Karm, and the 60th was collecting prisoners, guns and ammunition abandoned by the Turks round Sheria.

The retreat of the Turks was rapid but fairly orderly. During the summer they had prepared a line of defence just south of Ramleh, on which to fall back in case of need. This line included Latrun and the high ground behind it, and the hills on the opposite side of the Jaffa-Jerusalem road. In their retreat along the coast the Turks were driven past their prepared line and were never able to occupy it. Ramleh and Ludd were occupied by us on November 15; the line to Jerusalem had been cut the day before.

The town of Jaffa, on the coast, fell into our hands on November 17 and the enemy did not stop in his retreat along the coast until he reached the River Auja. Further inland he took up a position on the line of the

old Roman road from Jaffa to Jerusalem, running through Beit Ur el Tahta and Beit Ur el Foka, the Methar and Upper Beth Horons of the Bible.

The Commander-in-Chief, content with having reached Ludd, decided to try and make good a line eastwards from this point to Bireh on the Nablus road, nine miles north of Jerusalem, and if possible secure that city without fighting in the immediate vicinity of the town itself.

With this object, while holding the line of the Anja with the mounted troops and the 54th Division, he struck eastwards with the other two divisions of the 21st Corps, the 52nd and 75th, across the Judean hills, endeavouring to reach the Nablus road north of Jerusalem and thus cut off the city and its garrison from communication with the north.

It had been originally intended to wait until the 20th Corps could be brought up and to make this move north-eastwards with them, while the 21st Corps held the enemy in the coastal section, but the flight of the Turks and the capture of Jaffa decided him to lose no time but to make a bold push for possession of the Nablus road with the troops already at his disposal.

The two divisions moved east on parallel roads; the 52nd, by the Roman road which crosses the head of the valley of Ajalon at Beit Likia and passes over the hills through Beit Anam and Kubeibeh; the 75th, by the modern main road from Jaffa to Jerusalem through Kuryet el Enab, the Kirjath Jearim of the Bible.

The first of these roads was nothing but a mountain track, over which guns and wheeled vehicles could only be taken after the expenditure of much labour; the second was a well engineered metalled road, but at this time in bad condition and with several culverts destroyed by the retreating enemy.

The two divisions pushed on until they reached Kubeibeh and Enab respectively. A few miles beyond Kubeibeh the Turks were concentrated in a strong position of which Nebi Samwil, a hill nearly three thousand feet high, was the central point. The southern division reached Enab and was faced there by the western defences of Jerusalem itself.

Nebi Samwil, according to Moslem tradition, is the site of the tomb of the Prophet Samuel. It is of the greatest importance historically and strategically. The "*Mons Gaudii*" of the pilgrims, it is the point at which in travelling from Jaffa by the old route, they obtained their first view of the Holy City. It is the place, in all probability, if the story is a true one, at which Richard Cœur de Lion covered his face that he might not look upon the holy place which he was not permitted to rescue from the enemies of Christianity and never actually reached. It is also, most probably, the "Mizpah" of the Old Testament, "the place of observation," one of the centres visited annually in circuit by the Prophet Samuel to judge the people and the place where he proclaimed Saul the first King of Israel before the assembled multitude.

Strategically—it is the key to the capture of Jerusalem, in an advance

from the south and west. The only possible line of communications between Jerusalem and the north is along the Nablus road. This road runs almost due north and south along the ridge which divides the watersheds draining respectively into the Mediterranean and into the Jordan and the Dead Sea. The only communication for wheeled vehicles between Jerusalem and Eastern Palestine is by the Jericho road. This road crosses the Valley of the Kedron immediately outside the town, skirts the south end of the Mount of Olives, and after passing through Bethany makes a difficult and abrupt drop of one thousand feet in less than six miles towards the Jordan Valley.

Nebi Samwil commands direct observation of a large section of the Nablus road at a distance of five thousand yards. Owing to the rapid fall of the ground on the eastern side of the road, and the rugged nature of the ground, there is no alternative route to the north. The single line of communications by the Jericho road is not sufficient for a force holding Jerusalem. Amman, the nearest point on the Hedjaz railway, which runs down the extreme eastern border of the country, is nearly eighty miles away. The road leading there is metalled and fit for lorries in fine weather, but it has to cross the Jordan Valley, the bed of which is four thousand feet below the high ground on either side.

Moreover, were the ridge on which the Nablus Road runs once held by an invading force, the command of the Jericho road would probably be obtained.

The natural defences of Jerusalem from the west and south are exceedingly strong and the Turks had developed them well, but with Nebi Samwil lost, Jerusalem would be shut off from the north and its garrison, unable to get supplies, would be forced to surrender. However, for the time being, Nebi Samwil proved too much for the tired 52nd Division, who failed to carry it in the rush.

The 75th Division, too, was held up at Enab and lost heavily. More than one attempt was made to take Nebi Samwil. The 52nd Division was reinforced, both from the 75th and by mounted troops from the Desert Corps, but without avail. They succeeded in reaching the top of the hill, but could not drive the Turks off it. The two lines remained facing one another at a few yards' distance.

It is not surprising that the mosque over the reputed tomb of the prophet, situated as it was between the opposing forces, like so many of the churches in France, suffered considerably and lost its minaret. The two divisions had suffered heavy casualties and the weather having become very wet and cold the men became exhausted and there was a good deal of sickness. It became obvious, therefore, that Jerusalem could not be taken without a more deliberate operation with fresh troops, and it was decided not to make any further move until the 20th Corps arrived.

The Headquarters of 20th Corps was left at Beersheba with one division, the 53rd, in touch with a force of the enemy covering Hebron,

the 60th clearing up the spoils round Sheria and the 10th and 74th refitting at Karm. On November 17 the scheme for the forward move of the 20th Corps was issued.

The 53rd and the regiment of Corps Cavalry were temporarily detached under Major-General Mott, G.O.C. of the 53rd, to act directly under G.H.Q. They remained covering Beersheba, with orders to advance later northwards to Jerusalem, via Hebron. The 10th and 74th were to move to Deir el Belah on the 17th, and the 60th to the area north of Gaza on November 18. Corps Headquarters moved from Beersheba to the Red House on the Wadi Ghuzzeh, between Belah and Gaza, on the 18th. The whole Corps, less the 53rd Division, was thus concentrated round Gaza and ready to move forward into Palestine.

Before we left Beersheba it was arranged that the 53rd Field Ambulance Immobile section at Irgeig should move into Beersheba to take over the hospital, relieving the 60th and 74th sections which were to rejoin their divisions. The 10th Immobile section was at the same time to rejoin its division from Imara.

These moves took place on November 20.

Owing to the length of line of communication, the 21st and Desert Corps were now beginning to have difficulties with their evacuation. On November 19, under G.H.Q. orders, fifteen of our motor ambulances were handed over to them and the 32nd Field Ambulance of the 10th Division was sent up to open on the line of evacuation at Junction Station, where the Beersheba line joins the Jaffa-Jerusalem railway.

The move forward of the 20th Corps began on November 21, with the transfer of Headquarters from Red House, just south of Gaza, to Junction Station.

The Turkish railway to Gaza had never been completed. As mentioned before, it had been constructed during the previous summer from the rails taken up from the line south of Beersheba, but, whether from shortage of materials or for tactical reasons, it had only been brought as far as Beit Hanun, about five miles north of Gaza. It joined the Beersheba line, five miles south of Junction Station. In their retreat the Turks had not been able to do any serious damage to the line. They got most of their rolling stock away, but we managed to secure two locomotives and about thirty trucks. The latter had been a good deal knocked about by shell fire, and though full of ventilation holes, were still usable.

20th Corps Headquarters made one of the first trips on this line under British auspices in the move to Junction Station. It was an adventurous night journey; twenty officers were packed into a single guards' van. It was just possible for all of us to lie down by sandwiching like sardines with heads and tails alternate ways. The distance was less than thirty miles, and the journey, which lasted ten hours, was not without incident. The train was divided into two portions, the front half containing supplies, the rear half the Headquarters personnel and their equipment. The officers'

van was last but one, and their batmen and kits were in the last. There was an engine at each end. Some time in the course of the night there was a bang followed by a succession of bumps, and the train came to a stop. After a good deal of palaver outside, we were told that owing to a little misunderstanding with the points the front part of the train had run off the line into a field, but that our part was still on rail, and that without much delay we should be drawn off and taken on by the rear engine. We lay still, and after a considerable amount of waiting and shunting we started once more. At a later period we woke from the troubled sleep into which we had fallen to realize that we were moving with very uncomfortable oscillations and at a very rapid rate, in fact it seemed very much as if we were running away. Afterwards it transpired that owing to faulty brakes, this had really been the case, but we reached the bottom of the hill without mishap.

Just before dawn we reached our destination. The train came to a stop and the engine moved off to refresh itself. Unfortunately, the fact that we were on an incline was overlooked, and the train began to move backwards. This time we did not take the comparatively safe route by which we had come, but by a change of points ran on to the branch towards Jaffa. Now on this line, about five hundred yards from the station, was a wadi, the bridge over which had been blown up by one of our enterprising sappers a few days before, little thinking that the first train that would want to cross it would contain the Headquarters Staff of the 20th Corps. The train did not move rapidly for the gradient was not steep, but shortly there was once more a crash and a grinding, and we came to a stop. It was still dark and we were too closely packed to get up unless the emergency was great, but this time we were persuaded by the noise outside to turn out and see what had happened. We found that the rear carriage, in which were our batmen and our kits, though still attached to our own coach, was hanging at a dangerous angle over the edge of the broken bridge. Fortunately, it had become jammed there, so that it was not likely to precipitate itself into the wadi below and no harm had been done. Needless to say, those of the Headquarters Staff who had motor cars at their disposal did not take part in this adventure.

The 60th Division began its march forward from Gaza on the 21st and passed through Junction Station on the 23rd.

The 74th Division moved on the 24th.

At this time 21st Corps, with headquarters at Kubab, was holding the right portion of the line, and Desert Corps, with headquarters south of Ramleh, the left.

The A.D.M.S., G.H.Q., Major Bagshaw, was at Junction Station, controlling the evacuation of casualties from both corps. There were considerable numbers coming down and transport to the nearest casualty clearing station at Gaza was difficult.

On the 24th another field ambulance, of the 10th Division, was moved up and stationed at Beit Hanun, the termination of the Turkish railway.

The 10th Division left Belah on the 27th.

The 60th Division moved up to Enab on the 26th and relieved the 75th and 52nd Divisions on the line extending from Enab, through Nebi Samwil to Kubeibeh, Nebi Samwil forming the apex of a salient.

On the 28th the 60th Division drove off an attack by the enemy and for the moment the 52nd Division was retained in the line. A brigade of the 74th was then moved up between the 60th and 52nd Divisions.

The Headquarters 20th Corps now took over control of the right part of the line from the 21st Corps, retaining the 52nd under its control, and moved from Junction Station to the monastery at Latrun where the road from Junction Station joins the Jerusalem-Jaffa road.



20th Corps Headquarters—Monastery at Latrun.

Latrun is an interesting place. Formerly a caravanserai on the Jaffa-Jerusalem road, it is built on the west slope of a small conical hill which projects out into the valley. It was then the halting place for all tourists on their way from Jaffa to Jerusalem. With the advent of the railway to Jerusalem it fell on less prosperous times and was bought by a Trappist fraternity who converted it into a monastery. They planted extensive gardens and vineyards and, as Trappists are wont, devoted themselves to agriculture and wine production in a fairly big way. The house was added to and made quite comfortable. During the War, the monks, who were mostly French, were turned out and the establishment converted into an agricultural college. While the Turks were retreating the monastery was looted by the Arabs of the neighbouring village and much damage was done to the chapel and library. Many of the doors were removed and the woodwork destroyed. The books of the library were heaped up in a cellar and suffered considerable damage. Knocked about though it was, it did not form a bad headquarters; in fact it was the most civilized place we had occupied since leaving Egypt. My own office was in the dairy among an

assortment of quite up-to-date cheese presses. On the top of the hill above the monastery stands the ruin of a fine old mediæval castle, probably the very place mentioned in Joinville's account of the Crusade of St. Louis as having been originally a fort of the Maccabees. Louis debated the advisability of fortifying it but decided that it was too far from the coast to be held safely at that time when only the coast towns were in the possession of the Christians.

The Army had now reached a part of the country teeming with historical interest. Unfortunately, in the absence of permanent ruins, it is difficult to identify localities with certainty, but in the Old Testament we have a history so full of vivid detail that the general location of the scenes of the more important events are recognizable, even when the exact sites are no longer known.

The route we had taken after leaving Gaza was along the maritime plain known as Shephelah or Philistia in the Old Testament. This plain is about fifteen to twenty miles broad and is separated from the sea by a line of sand dunes of varying width which runs all along the coast. On the east it is bounded by the lower slopes of the Judean Hills. It is a fertile corn-bearing land with a soil of brown loam almost impassable for wheels in wet weather, but which soon dries in the sun into a firm cake and then makes a good surface for motors and other wheeled vehicles. Along this plain have passed during the world's history countless hosts of invaders. It is, and has ever been, the highway from Asia to Africa. From the time of the invasion of the land of the Hittites (sixteenth century B.C.) by Tothmes I, Pharaoh of Egypt, whose conquests are recorded on the walls of the Temple of Karnak, down to the present day, there has been a constant succession of marchings and counter marchings. Two at least of the greatest soldiers of the world's history, Alexander and Napoleon, have taken this road. It was fascinating to sit, as I did one afternoon, for an idle hour on the hill above Latrun, scored with the trenches which the Turks had prepared, and looking out on the plain stretching south and west, to muse on all that had happened there. In front to the south was the road leading to Junction Station and to Gaza. To the right, about five miles away, perched on an outlying hill, lies the village of Abu Shusheh, once the Canaanite town of Gezer. It was never conquered by Joshua, and only came into the possession of the Israelites on the occasion of Solomon's marriage to the daughter of the reigning Pharaoh as part of her dowry. In crusading times it was for long the headquarters of Saladin. Further to the right, showing up white among the green patches of orange orchards, is the modern town of Ramleh with the fine old crusading tower just visible. Almost continuous with Ramleh, and hardly visible among the trees is Ludd, the Lydda of the New Testament, famed for its association with St. Peter and later with our English patron saint, St. George of Cappadocia, who is reputed to have been buried there. Further on still is the line of yellow sand dunes separating the green of the orange groves

from the blue of the Mediterranean which forms the horizon. Among the sand dunes could just be distinguished the town of Jaffa, the so-called "port of Jerusalem," the Joppa of the Bible. Here it was that Solomon landed the timber for the Temple, floated down as rafts from the Lebanon coast. Here also it was that St. Peter had the dream which so much influenced the spread of Christianity to the Gentiles. It is the place, too, where countless visitors and pilgrims have first set their foot on the Holy Land. So much for what could be seen.

Not far away, but out of sight, are the modern Jewish villages which represent the ancient Philistine cities—Akir or Ekron the nearest, further off Esduda or Ashdod. Askalon on the coast retains its name, and of course most southerly of all Gaza. Gath has disappeared.

To the left, looking south one can see the beginning of the valley of Sorak, up which the railway now runs to Jerusalem, taking its name from Surah or Zorah, a village a mile or two further up which was the birth-place of Samson. The Book of Judges relates how he was taken back there by his people after his death at Gaza for burial near his old home. It was in some of these Philistine towns that the Ark of the Lord, captured in the time of Eli, made its resting places so uncomfortable for inhabitants that they were glad to pass it on to their neighbour, and eventually to send it back, up the valley of Sorak, to the nearest Israelite town, Bethshemesh, where again it brought such ill-fortune that it was sent on to Kirjath Jearim, the Khuryet el Enab of to-day. There it remained till it was taken in triumph to Jerusalem by King David.

The thought of the vicissitudes of the Ark during its captivity recalls an interesting theory which has been suggested, by whom I know not, to explain the extraordinary "guilt offerings" placed in the Ark by the Philistines before its return to the Israelites (1 Samuel vi. 4).

The Authorized Version of the Old Testament states that the disease which the Ark carried in its train and which dealt such terrible destruction to its possessors, was the non-infectious and homely one of "emerods" or "hæmorrhoids" and calls the effigies which were inserted in the Ark "golden emerods." In the revised version for the word "emerod" has been substituted the word "tumour" in both places, and the theory is that the disease which followed the Ark was not piles but bubonic plague, in which one of the symptoms is the formation of tumours or buboes on the patient.

Another most interesting point in the story is that side by side with the five gold tumours they placed in the Ark five gold mice. Now it has been discovered in recent years that bubonic plague is conveyed to man by the bite of a flea infected previously by biting a rat suffering from the disease—that without rats there is no plague. The association between the plague and the rat was certainly known in the Middle Ages, for many readers will remember the well-known picture of the "Plague of Ashdod" in the National Gallery by Nicolas Poussin, 1594-1665, in which the rat forms so

prominent a feature. It is suggested that the Philistines had already traced some connection between the mouse or rat and the plague and had recorded it in this way.

In contemplating one's more immediate surroundings one wondered whether the thirty-six odd centuries that have passed since the time of our first historical record had brought much change to the scene. There is little doubt that the country was formerly more populous, while the remains of terraces on the hillside show that cultivation was more complete in earlier times. One could not help trying to visualize the difference in the uniform and modes of transport of the armies of the ancient days. Did they, one wondered, water their horses as we were doing at troughs by the side of the far-famed well of Latrun? Did they have horse lines where we now have them? Did they park their war chariots in neat lines as we do our motor lorries? Was there a supply dump stacked with bales of compressed chopped straw or tibbin, used so much as fodder? Tibbin, we know there was, for it was the lack of it that caused so much trouble to the Israelites in making their bricks when it ceased to be a government supply, but probably it was not then compressed into neat bales bound up with iron bands! We may at least be assured that they did not hear the whirring in the sky which made us look up anxiously to see if the bird-like apparition had a black cross, or red, white and blue rings on its breast. Nor did they hear the whistle and tang of the descending bomb. War in those days must have confined itself pretty well to set battles. If one could have looked over the hill a mile or so behind one's point of observation, on a certain day some three thousand three hundred years ago, one might have seen a stream of fugitives fleeing down the valley from the passes of Beth Horon just above, into the plain of Ajalon. It was all that remained of the hosts of the five kings pursued by the army of Joshua during that long-drawn-out afternoon on which the sun stood still (Joshua x. 13). One would have heard no boom of artillery or rattle of musketry and machine guns. The only rattle would have been that of the hailstones, for the account says that: *They were more which died with hailstones than they whom the children of Israel slew with the sword.* But there would have been the same dead, wounded and prisoners to be accounted for after the battle and the same transference of power from one race to another as its result. There was not, however, much time for musings and Jerusalem had not yet fallen.

(To be continued.)

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In a series of over 6,000 cases of diphtheria gathered from many parts of Britain and Germany during the past five years, at least 95 per cent of the strains of *C. diphtheriæ* isolated have fallen into the *gravis*, *mitis* and "intermediate" types described in 1933. The *gravis* strains have been found to be associated with the highest case death-rate and the greatest incidence of paralysis. The case death-rate of "intermediate" infections approaches that of *gravis* infections and "intermediate" strains are at least the equal of *gravis* strains in tending to produce hæmorrhagic symptoms. The *mitis* strains are most commonly associated with laryngeal involvement but apart from this are rarely the cause of death. The suggested nomenclature of the types is further justified by the incidence and mortality of diphtheria among the immunized in areas in which the different types predominate. It is also justified, but not so definitely, by observations on animal pathogenicity. *Gravis* strains are so constantly pathogenic to animals that virulence tests with such strains are superfluous. The stability of types both in the animal and the human body is marked, though a number of observations are extant suggesting that the types may fluctuate under *in vitro* conditions. The discrepancy between the clinical virulence of *gravis* strains and their poor powers of producing toxin *in vitro* has so far not yet received an adequate explanation. Clauberg's suggestion that the variants from the three well-defined types which are met with may be best explained R-S variation within the types, the rougher strains representing the more virulent forms in each type, receives support from a wide survey of the accumulated observations. A considerable group of freely-growing and rough starch non-fermenting forms which are non-pathogenic appear to be an exception to this rule, as they would be classified as rough *mitis*. They may, however, eventually prove to be "diphtheroid" strains distinct from *mitis*. [This important statement of the views and observations of the Leeds workers on a subject which they have made peculiarly their own should be read in full. A wealth of data is presented which cannot be reproduced in a short summary.]

C. C. OKELL.

Reprinted from "Bulletin of Hygiene," Vol. 11, No. 11.

HOME OFFICE. **Annual Report of the Chief Inspector of Factories and Workshops for the Year 1935.** [WILSON, D. R.] Cmd. 5230. 106 pp. 1936. London: H.M.S.O. [2s.].

The year 1935 saw considerable industrial activity which by reason of the increased number of persons at risk and the increased rapidity of work was associated with a substantial increase in the number of accidents. To this matter special attention is paid in this report and in particular to the undue increase which has occurred in accidents occurring to young persons; thus in 1928 the incidence per 100,000 employed was 2,762 for adults and 2,844 for young persons, but in 1935 the figures were 2,542 for adults and 3,130 for young persons. Organized efforts are being made to meet this trouble by giving youths instruction in the risks attached to work before they are permitted to commence work. Interest attaches to the chapter devoted to health where a plea is advanced that the hours of employment of young persons should be substantially reduced. The infection of tuberculosis may pass from one worker to another, but it is not a peculiar industrial risk to-day, except from inhaling the dust of silica or asbestos; still, one instance is quoted in glass-blowing where the blow-pipe is rapidly transferred from the gatherer to the skilled blower, conveying any possible infection with it. Three skilled glass-blowers were found with open tuberculosis. Lead poisoning continues to recede as a main industrial risk; there were only 136 factory cases as compared with 199 in 1930, 243 in 1920, and 505 in 1910, while deaths only numbered 17 as against 44 in 1920 and 32 in 1930. Anthrax also, as an industrial disease, seems to be nearly under control; only 20 cases with 3 deaths occurred, as against 48 with 11 deaths in 1920. By contrast epitheliomatous ulceration shows no sign of diminishing; there were 171 cases with 38 deaths, of which exposure to mineral oil in cotton-spinning accounted for 62 cases with 20 deaths; pitch and tar were responsible for nearly all the remaining cases. A favourable reduction is reported in cases of gassing, particularly by carbon monoxide which claimed 56 cases compared with 85 in 1934. The main health hazard to-day lies in exposure to injurious dusts of various kinds, especially of silica and asbestos; here no reduction took place in the number of deaths, since silicosis claimed 126 victims and asbestosis 15. As of old the pottery industry held an invidious distinction regarding lead-poisoning, so now it stands out for causing silicosis; it accounts for more than double the cases of the next injurious trade, the sandstone industry. However, we learn with pleasure that there is probability of alumina being substituted for powdered flint for placing chinaware, which has always been the most harmful process. Sandblasting also is coming under control as steel shot are substituted for sand or flint grit in the blast. Again, the grinding of metals is losing its terrors as the old-time grindstone gives way to artificial abrasive wheels; thus whereas in 1926 there were 1,600 sandstone wheels in the Sheffield

district, in 1933 there were only 200 left; while in the Birmingham district 480 sandstone wheels had been reduced to 22. The effect of these changes and of better control of dusts generated can only become manifest in later years for diseases which are so slow in onset and progress as the pneumoconioses. An interesting investigation is described into poisoning by dust from *Mansonia* wood which sets up nausea, muscular weakness, sore throat, epistaxis and sneezing; apparently this wood contains a toxic alkaloid. Other matters are also reported upon, such as the advance of industrial welfare and the control of hours of employment. Taken as a whole the report shows factory life in Great Britain as a far less injurious matter than in the past.

E. L. COLLIS.

Reprinted from "Bulletin of Hygiene," Vol. 11, No. 12.

KAUFMANN, A. Neuere Gesichtspunkte für den Aufbau von Staubatemschützern. [**New Ideas in the Making of Masks for Protection against Dust.**] *Zent. f. Gewerbehyg. u. Unfallverhütung.* 1936, v. 23, 180—82, 4 figs.

The author has brought out a mask which he maintains is an improvement on those in general use for protection against dust. The chief improvement is that the filtering material consists of several layers of artificial silk; when the outer layer becomes blocked with dust the workman can remove it and then continue breathing without the resistance of a partially blocked filter. With a resistance of from 5 to 6 milligrams about 60 per cent of the finest dust is caught. To improve the action of the silk it is soaked in oil. Such a filter with six layers can take up 2 to 3 grammes of dust before it is out of action.

A similar mask is described in which the filtering material consists of layers of thin paper, which can be removed in the same way as the layers of silk; but these filters have a greater resistance to inspiration. Sponge rubber masks are often unsatisfactory from the fact that in their manufacture a kind of resinous oil is often used which, if it comes in contact with an alkali, forms a soap which is an irritant to the skin of the face. They also take up much moisture from the expired air.

A. J. COLLIS.

Reprinted from "Bulletin of Hygiene," Vol. 11, No. 12.

DALRYMPLE-CHAMPNEYS, W., HARRIES, E. H. R., HOBDA, W. H. **The Future of the Isolation Hospital.** *J. Roy. San. Inst.* 1936, v. 57, 140-47, 2 figs.; 147-51; 151-62, 7 figs.

These papers were delivered at the Health Congress of the Royal Sanitary Institute. Sir W. Dalrymple-Champneys said that the public required education with regard to the real facts in infectious disease. The matter of the selection of cases for admission to the fever hospital required attention, and in this connexion the consideration of the policy

of removing cases of scarlet fever to hospital whilst infectious streptococcal conditions which could not be so classified were left at home could no longer be postponed. Adequate accommodation in isolation hospitals for serious cases of measles and whooping-cough was still lacking in different parts of the country, and it was worth while inquiring if some of the accommodation now reserved for scarlet fever and diphtheria might not be better utilized for these cases. The system of cubicle isolation had now found wide acceptance but it had not yet been exploited to the full limit of its usefulness. In respect of the location of isolation hospitals he thought that in large centres the *ad hoc* institution would remain, but in rural areas the provision of an isolation block as an integral part of a general hospital, as in Denmark, was worthy of consideration.

Dr. Harries believed that in view of the wider conception now held of the functions of isolation hospitals their future was assured. They are now hospitals in the true sense and admit for treatment patients suffering from acute specific infections, compulsorily notifiable or not. Removal to hospital is arranged not alone upon grounds of infectivity, but for therapeutic, social and economic reasons also. The reception by isolation hospitals of patients suffering from a variety of specific infectious diseases implies more than an increase in the number of beds. In order that the patients may be protected as much as possible from cross-infection there must be adequate bed-spacing, efficient and adequate nursing staff, and a sufficient number of single-bedded chambers. Specialist medical services and the necessary equipment must be provided also. For some time to come the isolation hospital must continue to deal with the acute specific infections, but in the event of the public agreeing to the specific control of certain of these, any surplus accommodation might be provided for example for rheumatic children.

Mr. W. H. Hobday dealt with the question from the standpoint of the architect. As new methods were introduced so must the architect continue to exert his ingenuity to meet the new conditions. The era of the small isolation hospital is passing but he asked what the upper limit of size of fever hospitals was to be. He also raised the question of the suitability of multi-storied hospitals for infectious diseases. With regard to ward construction the tendency was now to divide the large ward by partitions, and arrange the beds in parallel. A demand for an increased number of single-bed wards had arisen, and this had raised many interesting problems in the detail of construction and layout of service corridors, lavatory basins, sun protection, and sanitary annexes. He believed that the future isolation hospital will get larger, that the big open ward is doomed, that the ward unit will get smaller and smaller until eventually it reaches one room or cubicle per patient, and that provision must be made for operating theatres, X-ray rooms and laboratories.

A. JOE.

Reprinted from "Bulletin of Hygiene," Vol. 11, No. 12.

KELLER, A. E. & HARRIS, S. Jr. Immediate Allergic Response Following a Schick Test. *Amer. J. Pub. Health.* 1936, v. 26, 809-10.

Two cases in which unusual reactions of an allergic type followed the Schick test are described. The first was in a nurse who having been given three doses of toxin-antitoxin mixture and several subsequent Schick tests was eventually found to have become Schick positive again and was given 0.5 cubic centimetre of alum-precipitated toxoid. A month later she was retested and found negative. Some six months later she was again Schick-tested and within fifteen to thirty minutes after this test she developed oedema at the sites of injection both of toxin and control, followed by dyspnoea, swelling of face and eyelids and general urticaria. She was given adrenalin and the symptoms soon subsided. The second case was in a medical student who in 1934 was given 0.5 cubic centimetre of alum-precipitated toxoid. A Schick test ten months later was followed immediately by swelling at the sites of injection of both toxin and control and by giddiness, suffusions of the eyelids, burning and itching of chest and feet. Adrenalin was given and the symptoms rapidly subsided. It may be added the Schick test in both cases was eventually read as negative. [See also *Bulletin of Hygiene*, 1936, v. 11, 821.] C. C. OKELL.

Reprinted from "Bulletin of Hygiene," Vol. 11, No. 12.

MITTAG, G. & OTTO, H. Der Befund von Diphtheriebacillen des Typus *Mitis* bei Scharlachkranken. [The *mitis* Type of *C. diphtheriae* in Scarlet Fever Patients.] *Klin. Woch.* 1936, v. 15, 1261-3, 1 fig. [14 refs.]

An account is given of an interesting instance of spread of infection with *C. diphtheriae* which took place in a scarlet fever station consisting of three wards. During a period of seven months forty-five scarlet fever patients were warded in the station and of these thirty-four at some time or other during their stay developed an infection of nose or throat with *C. diphtheriae*. None, however, showed any definite signs of clinical diphtheria though, in a few patients, non-specific symptoms accompanied the infection. The infection was probably introduced by a single patient. The organisms isolated from all the positive patients proved to be of the *mitis* type and were virulent to guinea-pigs. The outbreak is recorded as illustrating that while the *mitis* type may be readily disseminated among a group of patients, its spread may be unaccompanied by the typical clinical symptoms of diphtheria. The outbreak may be considered a "carrier" epidemic rather than one of actual disease. C. C. OKELL.

Reprinted from "Bulletin of Hygiene," Vol. 11, No. 12.

ANDERSON, T. **The Practical Aspects of Anti-Diphtheria Immunization with a Report of the Results in Ruchill Fever Hospital.** *Glasgow M. J.* 1936, v. 125, Med.-Chir. Trans. 88-100. [15 refs.]

CRUICKSHANK, R. **II. Active Immunization against Scarlet Fever.** *Ibid.* 101-6.

DOW, W. **III. The Practical Aspects of Measles Immunization.** *Ibid.* 106-15.

Dr. Anderson presents the results of active immunization against diphtheria of the nursing staff of the Ruchill Fever Hospital from 1926-34 inclusive. During that time among 507 natural immunes and 187 nurses immunized to the Schick negative state 3 cases of clinical diphtheria occurred. The other main feature of this paper is the author's views on the practical application of the method. He believes it provides an obvious remedy for outbreaks of diphtheria in closed institutions, schools and nursing staffs. Before extending its application widely in towns, however, careful consideration is required. There is reason to believe carriers will be increased, and that there will be a considerable number of atypical and mild cases. Dr. Anderson is of the opinion that until some scheme is introduced which makes possible the immunization of 30 to 40 per cent of children before their second or third year, so-called wholesale immunization as at present practised is not merely toying with the situation, but may in fact be dangerous to the non-immunized population.

Dr. R. Cruickshank relates the experience obtained in the active immunization against scarlet fever of the nursing staff of the Glasgow Royal Infirmary over a period of seven years. No cases of scarlet fever occurred in 567 natural immunes, but in 214 Dick positives, the majority of whom were given a course of immunization, 15 developed scarlet fever. Three of these occurred in 105 nurses whose last Dick test was negative (2·8 per cent), 6 among 40 nurses whose last Dick test was positive (15 per cent), 5 among 20 susceptible nurses who had not been immunized (25 per cent), and 1 among 8 nurses who had been immunized and not retested. The author suggests that in a population of adults there are certain individuals whom it is very difficult to immunize. With regard to whether general immunization against scarlet fever is practicable or desirable, it has to be borne in mind that if the hæmolytic streptococcus is the causal organism it may be claimed that the only difference between scarlet fever and streptococcal tonsillitis is the occurrence of a rash in the former. Since active immunization against scarlet fever protects against toxin only, and since tonsillitis is as likely to occur among Dick negative as Dick positive nurses, it would appear that little is to be gained from the immunization of the general community except administratively, since scarlet fever is notifiable and tonsillitis is not. If, however, it could be shown that immunization will help to lessen

the incidence of the complications of both scarlet fever and tonsillitis, e.g. otitis media and nephritis, then its general adoption would be worth while advocating.

Dr. Dow discusses the inherent difficulties encountered in investigations to determine the efficacy of convalescent and adult serum in measles immunization. For example, in any comparison of a series of treated with a series of untreated cases, the age should be similar in each group, both series should occur in the same epidemic, the series should be numerically equal, and the intensity and conditions of exposure the same. The author examines three sets of figures, one from London and two from Glasgow, in the light of these requirements, and draws attention to some possible fallacies. In conclusion, however, he states that all are agreed that convalescent serum is fairly potent in respect of prevention and attenuation of disease simply because of the accumulated experience of so very many workers in different parts of the world, but its application is limited by the difficulty in collecting adequate supplies. With regard to adult serum he thinks the consensus of opinion seems to be that it has apparently some power in reducing the severity of the illness.

A. JOE.

Reprinted from "Bulletin of Hygiene," Vol. 11, No. 12.

Reviews.

A HANDBOOK OF HYGIENE FOR STUDENTS AND TEACHERS. By Cyril G. Eastwood, B.Sc., M.B., Ch.B.Manch., M.R.C.S.Eng., L.R.C.P.Lond., D.P.H.Leeds. London : Edward Arnold and Co. 1936. Pp. viii + 358. Price 6s.

The author has set out to demonstrate the important principles in connection with the practice of hygiene with special reference to the health of the child.

He has realized that while numbers of books are published dealing with this subject, few if any of them give at the same time a sufficiently clear exposition of the physiological fundamentals in connexion with the human body from which the science of hygiene has largely sprung.

He has consequently devoted a considerable amount of space to a simple and lucid account of the essentials of physiology, a study of which enables an infinitely better understanding by the reader of the underlying reasons for the practice of hygiene in its various aspects.

After devoting approximately one-third of the book to the physiological side of the question, he proceeds to discuss nutrition and dietetics, the hygiene of children including the teaching of hygiene and the law relating to school children, school hygiene, and diseases of children.

The book will form a useful addition to the armamentarium of all school teachers, either as a help to them in their school work, or as an aid to imparting instruction in this subject to others.

The book can also be recommended to those of the general public who are interested in the health of the nation, realising the extent to which it is contributed by the maintenance of a healthy environment for the child, as it is written in clear and simple language.

A. E. R.

MUSCULAR EXERCISE. By Dr. Grace Eggleton, M.R.C.S., L.R.C.P., M.Sc.
London: Kegan Paul, Trench, Trübner and Co., Ltd. 1936.
Pp. x + 298. Price 10s. 6d. net.

This book has been written in an attempt to bring to the notice of those interested the way in which our bodies react to exercise. No attempt has been made to discuss physiology as such, in fact the whole tone of the book is that of a lay scientific work.

The arrangement of the chapters is good and treats thoroughly, though not in too detailed a fashion, of the alterations taking place in each system during muscular exercise. Chapters on changes in respiration and circulation are dealt with at some length as is only natural, but some phases of exercise are considered which are apt to be overlooked in considering the subject—for example: maintenance of normal acidity and hormone activity.

The book is arranged, as the author says, so that each chapter forms a monograph which can be read separately, though for the lay reader it is advised, and rightly, that the book should be read as a whole. A useful feature in this connection is a glossary at the end.

“Muscular Exercise” should prove of the greatest use and interest to those particularly interested in sport. It should form a useful appendix to Bainbridge’s classic work, especially for the non-medical reader, and of some guidance to athletic trainers.

The print is clear and the matter is set out in an attractive way. Possibly a minor criticism is that some of the diagrams, though adapted from standard textbooks, may not be too clear to the general reader.

P. J. L. C.

A TREATISE ON MATERIA MEDICA AND THEIR THERAPEUTICS. The late Rakhal Das Ghosh. By Birendra Nath Ghosh, F.R.F.P. & S.Glas.
Calcutta: Hilton and Co. 1936. London Agents: H. K. Lewis and Co., Ltd. Pp. xv + 724. Price Rs. 7.8 or 12s. 6d. net.

The fourteenth edition of this work appears in a considerably enlarged form and now takes its place as one of the larger treatises on this subject. In addition to alterations required as a result of a new B.P. Codex having appeared, much new work has been added to the Pharmacology Section. The grouping together of drugs having therapeutic actions upon the different systems or organs is a good feature of the work. The Pharma-

cology Section is now most comprehensive and includes descriptions of the use of antitoxins, vaccines and radium. As a reference book this volume will be found very useful for consulting rooms and libraries. J. H.-S.

APPENDICITIS, WHEN AND HOW TO OPERATE. By W. J. Stewart McKay, M.B., M.Ch., B.Sc. Sydney: Angus and Robertson, Ltd. 1936. Pp. x + 260. Price 12s. 6d.

The book, which runs into 260 pages divided into eighteen chapters, is written for the country doctor with a view to assisting him in the diagnosis of acute appendicitis and educating him in detailed surgical technique and after treatment, so that he may tackle the problem single handed and operate in emergencies where skilled surgical aid is not available.

It is unfortunate in a work of this description that the author should favour Battle's incision to the exclusion of others less liable to produce permanent damage to the patient in unskilled hands.

Several misprints and inaccuracies are noted in the text and in the diagrams, but the reader cannot fail to be impressed by Mr. McKay's enthusiasm for his subject which must react beneficially in stimulating interest in this important subject. G. M.

FAVOURITE PRESCRIPTIONS (*The Practitioner*). Edited by Sir Humphry Rolleston, Bt., G.C.V.O., K.C.B., M.D., F.R.C.P., and Alan A. Moncrieff, M.D., F.R.C.P. London: Eyre and Spottiswoode, Ltd. 1936. Pp. 227. Price 10s. 6d.

This book is not to be confused with one of similar title published by Messrs. Churchill in 1926. The volume under review consists of a series of articles reprinted from the *Lancet*, each of which deals with the prescriptions in use at one of the great London hospitals.

The work thus avoids the objectionable features of most collections of prescriptions in that it does not offer a bewildering mass of formulæ presented without indication of their differing merits or suitabilities. The discussions of the various formulæ are edited by Sir Humphry Rolleston and we need offer no better recommendation than this to prospective readers, who will find both profit and amusement in this book.

J. H.-S.

CLINICAL HANDBOOK FOR RESIDENTS, NURSES AND STUDENTS (being the Routine Methods of St. Vincent's Hospital, Sydney, by Members of the Staff of the Hospital). Edited by Victor M. Coppleson, Ch.M., F.R.C.S., F.R.A.C.S., and Douglas Miller, Ch.M., F.R.C.S., F.R.A.C.S. London and Sydney: Angus and Robertson, Ltd. 1936. Pp. x + 205. Price 6s.

This is a new work and one which will arouse interest. It is an advantage for a book of this kind, which covers practical instruction in a variety of surgical, medical and pathological procedures, to be based on the

actual practice at one large general hospital. This handbook contains chapters on sterilization, minor operations, pathological investigations and their applications, besides the usual sections on poisons, nursing, etc. One welcome feature is the section on anæsthesia. We think this book will soon establish itself as a favourite handbook for senior students, not alone in Australia. It would appear to be well worthy of inclusion in the Service officer's personal library.

J. H.-S.

PRINCIPLES OF BACTERIOLOGY AND IMMUNITY. Second Edition. By W. W. C. Topley, M.A., M.D., M.Sc., F.R.C.P., F.R.S., Professor of Bacteriology and Immunology, University of London, Director of the Division of Immunology, London School of Hygiene and Tropical Medicine; and G. S. Wilson, M.D., F.R.C.P., D.P.H., Professor of Bacteriology as applied to Hygiene, University of London, London School of Hygiene and Tropical Medicine. London: Edward Arnold and Co., 1936. Pp. xv + 1645. Price 50s.

Topley and Wilson's book, "Principles of Bacteriology and Immunity," is so well known to our specialists in pathology that it requires no introduction.

A second edition has now been published and on this occasion the work has been combined into one volume which has certain advantages over the previous edition, consisting as it did of two separate volumes.

The new edition is thoroughly up to date and includes accounts of work published only a few months ago. It thus differs from many large works which frequently are almost out of date before publication. The authors must be congratulated on producing so comprehensive a book with such wealth of detail and including all the latest ideas.

The book is primarily for the advanced student and teacher, but it is so clearly written and the subject matter so admirably arranged that the elementary student will find it a most valuable book to consult when seeking detailed information on any point in bacteriology and immunity.

At the end of each chapter there is a full list of references which the research worker will find invaluable.

L. T. P.



Notices.

THE HEALTH CONGRESS OF THE ROYAL SANITARY INSTITUTE, 1937.

THE RIGHT HON. THE EARL OF DUDLEY has consented to act as President of the Health Congress, which is to be held at Birmingham from July 12 to 17, 1937. He will deliver his Inaugural Address on Monday afternoon, July 12.

The Minister of Health, the Right Hon. Sir Kingsley Wood, will address a general session of the Congress on Tuesday.

The deliberations of the Congress will be divided among eight sections dealing with :—

- Preventive Medicine.
- Engineering, Architecture, and Town Planning.
- Maternity, Child Welfare, and School Hygiene.
- Veterinary Hygiene.
- National Health Insurance.
- Hygiene in Industry.
- Tropical Hygiene.
- Sewage Disposal.

In addition, there will be conferences of Representatives of Local Authorities, Medical Officers of Health, Engineers and Surveyors, Sanitary Inspectors, and Health Visitors.

THE ROYAL SANITARY INSTITUTE.

A DISCUSSION on "The House as a Home : Design, Construction and Equipment as they affect Comfort," will take place at a Sessional Meeting to be held at the Royal Sanitary Institute, 90, Buckingham Palace Road, S.W.1, on Thursday, February 18, at 2.30 p.m. The discussion will be opened by Dr. H. A. Fawcett, Principal Assistant Medical Officer, Housing Section, Public Health Department, London County Council, Mr. Percival T. Harrison, M.Inst.C.E., Borough Engineer and Surveyor, Finchley, and Mr. H. H. Clay, of the London School of Hygiene and Tropical Medicine. The Chair will be occupied by Mr. Osmond Cattlin, M.Inst.C.E., Chairman of the Council.

EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc.

Correspondence on matters of interest to the Corps, and articles of a non-scientific character, may be accepted for publication under a nom-de-plume.

All Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps" will (unless the Author notifies at the time of submission that he reserves the copyright of the Article to himself) become the property of the Library and Journal Committee, who will exercise full copyright powers concerning such Articles.

A free issue of twenty-five reprints will be made to contributors of Original Communications and of twenty-five excerpts in the case of Lectures, Travels, Clinical and other Notes, and Echoes of the Past.

Reprints or excerpts, additional to the above, can be furnished on payment if specially ordered at the time of submission of the article for publication.

Communications in regard to editorial business should be addressed—"The Editor, JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, War Office, Whitehall, London, S.W. 1."

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Communications in regard to subscriptions, change of address, etc., should be addressed "THE MANAGER, JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, A.M.D.2, WAR OFFICE, WHITEHALL, LONDON, S.W. 1."

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Journal of the Royal Army Medical Corps.

Original Communications.

JOHN HUNTER (1728-1793).

It was fortunate for the Army in John Hunter's time that a threatened consumption drove him to seek a change of climate and he accepted a Staff Surgeoncy in the Army in 1760 and sailed with Hodgson's Expedition to Belleisle in 1761, and while there he studied coagulation of the blood ("Treatise on the Blood, etc."). In '62 and '63 he served with the British Army in Portugal and some of his experiences in that campaign are given below in the report of Professor Gask's lecture, which is reprinted, by permission, from the *British Medical Journal*, of February 20, 1937.

Hunter went on half-pay in '63, returned to London and resumed practice as a surgeon. But his greatest service to the Army was still to come, for no less than twenty-three years later (1786) he was appointed Deputy Surgeon-General and in 1790 he was given the highest medical post in the Army, namely, Surgeon-General and Inspector-General of Hospitals, an appointment he held till his death in the autumn of '93.

It is said that in manner Hunter was impatient, blunt, and uncere-
monious, often rude and overbearing. It was also said that he was a Tory in politics and that he would have preferred to see his beloved museum on fire rather than show it to a democrat.

Further, he is credited with having expressed the very sensible view that any rascals who were dissatisfied with their country should be good enough to leave it. In fact, the Surgeon-General of that day seems to have been possessed of many of the characteristics—not forgetting his lack of eloquence—which are sometimes ascribed to General Officers as a class.

But what is regarded as most striking by those who study the life of Hunter is the seemingly superhuman energy of the man. In Hunter's time the Medical Service of the Army was controlled by a Physician-

General and a Surgeon-General, but we know that his Physician-General colleague (Sir Clifton Wintringham) was old and really past work so that the duties of both offices devolved upon Hunter. During his term of office he was responsible for the medical provision of ten expeditions sent overseas. Yet in spite of these responsibilities he maintained his position as undisputed head of the surgical profession and found time to complete his great book, "The Blood, Inflammation and Gunshot Wounds." Hunter's Army career and the spirit in which he undertook his military duties are well summed up in the letter he wrote to George III when dedicating his famous book to that Monarch.

TO THE KING.

MAY IT PLEASE YOUR MAJESTY.

In the year 1761 I had the honour of being appointed by Your Majesty a surgeon on the staff in the expedition against Belleisle.

In the year 1790 Your Majesty honoured me with one of the most important appointments in the medical department of the Army, in fulfilling the duties of which every exertion shall be called forth to render me deserving of the trust reposed in me, and not unworthy of Your Majesty's patronage.

The first of these appointments gave me extensive opportunities of attending to gun-shot wounds, of seeing the errors and defects in that branch of military surgery, and of studying to remove them. It drew my attention to inflammation in general, and enabled me to make observations which had formed the basis of the present Treatise. That office which I now hold has afforded me the means of extending my pursuits, and of laying this work before the public.

As the object of this book is the improvement of surgery in general, and particularly of that branch of it which is peculiarly directed to the service of the Army, I am led by my situation, my duty, and my feelings, to address it, with all humility, to Your Majesty.

That Your Majesty may long live to enjoy the love and esteem of a happy people, is the fervent wish of

Your Majesty's

Most Faithful Subject,

And Most Dutiful Servant,

JOHN HUNTER.

*Leicester Square,
May 20, 1793.*

JOHN HUNTER, ARMY SURGEON.

LECTURE AT ROYAL COLLEGE OF SURGEONS.

A SPECIAL lecture was given by Professor George E. Gask at the Royal College of Surgeons of England on February 15 on "John Hunter in the Campaign in Portugal, 1762-63." A short time ago there came into the market, and was acquired by the College, a bundle of MSS., the property of John Campbell, Earl of Loudoun, who commanded the British

Expedition to Portugal at the end of the Seven Years' War. This campaign was quite an unimportant side-show, with practically no fighting, and military historians dismissed it in a few words; but Lord Loudoun, though not conspicuous for military genius, had the merit of being tireless in matters of documentation, which accounted for the preservation of the papers. As some of the documents relate to John Hunter they have a special interest for the College, and to Professor Gask was given the duty of arranging them.

John Hunter, said the lecturer, quite early in life seemed to have thought of a military career. When he came to London in 1748, at the age of 20, he wrote that if he could not help William he would not mind going into the Army. Ultimately, in 1760, he did enter the Army, possibly for health reasons, obtaining an appointment as Staff Surgeon in the Expedition to Belleisle, and when the campaign in Portugal was organized he was sent with four foot regiments to Lisbon as one of the surgeons for the military hospital. Professor Gask exhibited a list of the hospital staff. The director was William Young, who received 25s. a day, and there were two physicians, William Cadogan and Michael Morris, who received 20s., and three surgeons, John Hunter, William Maddox and Francis Tomkins, who only received 10s. There were also two apothecaries and sixteen surgeons' mates. Another list gave the names of the servants attached to the hospital, and it was specially interesting to note that these included a staff of nurses. The matron was remunerated at the rate of 2s. 6d. a day, the two head nurses at 1s., the same rate of pay as was received by the three cooks and the five washerwomen, but the pay of the fifteen nurses was only 6d. It might come as a surprise to some that nurses should have been attached to a military hospital at this period. One theory was that the nurses were really camp followers—that is, wives of the soldiers—but in Professor Gask's view all the evidence went to show that these women were recruited in London, probably from the voluntary hospitals, and sent out to Portugal. They were not, of course, trained as nurses nowadays were expected to be trained, but they were nevertheless professional women.

DOCUMENTS FROM THE CAMPAIGN IN PORTUGAL.

Among the documents exhibited was one from Lord Loudoun addressed to the Director of the hospital, ordering him and the staff to repair to Portsmouth for embarkation on the Hospital Ship "Betty," which was to be convoyed to Lisbon. Another was a return of the sick on board this boat during the voyage, the number being thirty-four. On arrival at Lisbon the hospital was established in four houses. It was remarked by the Adjutant-General that though the hospital was rather over-staffed none of the nurses could be discharged, as their places could not be filled in emergency. The discipline of the hospital was set out on a sheet of standing orders, and was an iron one—the term "black hole" was even mentioned among

the penalties. Hunter, who had a Scottish solicitude with regard to his pay, applied for the position of Deputy Director, but, in fact, that post was never filled. Later on, Cadogan, one of the physicians, being invalided home, he applied for the vacant post—"I take the liberty to recommend myself, and I hope the following reasons will plead my excuse"—but he did not get the appointment. Loudoun being unwilling to lose the services of a good surgeon.

Professor Gask showed a map of the campaign. The British force advanced along the Tagus and took its stand at Santarem, where a base hospital was established. Among the various documents collected were sick lists, but it was remarkable that among the casualties there was no mention of a wound. One return showed the sick list of the 83rd Regiment, and Professor Gask ran through the diseases—asthma, fever, pain in the head, flux, diarrhoea, swelling in the legs, and so on, "the age-long complaints of the Army." The letters from Hunter to the Commander-in-Chief concerned routine matters of administration, such as arrangements for transport, evacuation of the sick, and the like. One document set out his proposals for a temporary or flying hospital. They appeared to be very sensible ones, succinctly expressed, and such as, Professor Gask thought, would be acceptable to any Director-General to-day. The idea that Hunter could not write a letter and had to get his letters written for him was finally disposed of by this correspondence. He was undoubtedly perfectly competent to write a good precise letter. They were business communications, not remarkable for literary style or epigram, but he was a very faithful correspondent of the Commander-in-Chief.

Another common idea about John Hunter was discouraged by this correspondence—namely, that he was a quarrelsome, contentious individual. From some of the letters it appears that fierce disputes arose between his fellow surgeon, Francis Tomkins, and more than one of the surgeons' mates, and in the expostulatory letter written by one of the mates complaining of Tomkins' high-handed conduct over a small dereliction it was mentioned that Mr. Hunter was present, and no doubt would be prepared to verify the facts, but that he took no part in the dispute, the matter being one which did not concern him.

By the middle of November, 1762, an armistice had been declared, so that there was no further fighting. The subsequent papers were concerned chiefly with the return of the expedition to England. In one letter John Hunter was asked to send in a statement as to how many boats would be required to evacuate the sick. The final document was a list of the officers, Hunter among them, who had served from February 10, 1762, to May 14, 1763, with their pay sheet. Hunter, who had taken the opportunity while in Lisbon to carry out experiments on the organs of hearing in fishes, returned to London, retired from the Army on half-pay, and, according to G. C. Peachey's "Memoir," found his way first of all to the house of Robert Home, whose daughter Anne he married eight years afterwards.

THE TREATMENT OF FRACTURES.

A LECTURE DURING THE WINTER COURSE OF TRAINING, 1935-36, MALTA.

BY BREVET LIEUTENANT-COLONEL D. C. MONRO.

Royal Army Medical Corps.

I HAVE chosen the subject of fractures as my contribution to our course of lectures this winter, not in an effort to live up to my title of "local expert"—few, indeed, can call themselves expert in such a vast subject—but rather because, in the first place, I thought a professional subject was expected of me, and secondly, that by indicating in a general way the tendencies in more recent methods of treatment, and the beliefs on which these methods are based, my remarks might be of some assistance to those whose time is taken up more with administration, or the study of medical subjects in general.

It is quite unnecessary for me to remind you of the deformity and serious crippling, particularly in the case of limbs, that a badly treated fracture leads to. In the Service, such a state of affairs would invariably lead to invaliding, and all its consequences—unemployment, cost to the State, etc. A badly treated fracture is the very worst form of "walking or rather hobbling advertisement," and to anyone with only half a conscience responsible for such a result should be a subject for self-incrimination.

Only within comparatively recent years has the profession become sufficiently alive to the fact that something had been lacking in the general conduct of fracture cases in medical institutions: witness the comparatively recent Commission on the Treatment of Fractures, the increase in numbers of orthopædic specialists and consultants, the establishment of special fracture clinics, and the spate of writing on the subject in medical journals.

The more senior of us will remember what scant and sketchy instructions—compared with modern teaching—were given at medical schools, when we were students. I believe that it would not be far wrong to state that the more rational systematic instruction on the subject is the product of post Great War years.

Twenty years ago a fracture case was regarded as a slightly unwelcome and rather annoying occupant of a bed which might well accommodate an interesting "abdomen." The usual examination was of course carried out, and as much reduction as possible effected, all efforts being directed towards getting the case out and home in an ambulatory splint as soon as possible. The after-treatment of the case was, to say the least of it, haphazard, and too often left to a busy general practitioner, who "did his best." The more fortunate cases were followed up to some extent, the after-treatment

consisting mainly of periodic adjustment of splints, and after a long and tedious period of inactivity on the part of the injured limb, the case would be handed over to the "tender mercies" of some burly masseur, who based his treatment too often on the assumption that the patient was not trying, or chicken-hearted, and considered the forcible moving of stiff joints and the breaking down of adhesions his main object and *raison d'être*.

Fifty years ago Lucas-Championnière established a reputation in Paris, largely because he discarded irksome splints early and employed massage. He based his methods on the theory that a certain amount of movement at the site of fracture stimulated union: he even employed local pounding and hammering directed at the fracture site from the extremity of a long bone. Speaking confidentially on the secret of his success as a world-renowned masseur he said the reason is: "I never hurt a patient" (Mennell). As judged by the standards of those days, his results appear to have been good, and most certainly his patients thought much of him. Many years later, Arbuthnot Lane, advocating that accurate reduction was the crux of the question of treatment, and making use of a rigid technique of asepsis, such as Lister could scarcely have visualized, reduced most fractures by open operation under direct vision, retaining the fragments in position by internal splints. His results were apparently excellent, at all events in cases in which the internal splint, usually a metal plate, was well tolerated. All surgeons recognized the paramount importance of overcoming the pull of tonic and shortening muscles by some form of fixation or constant extension, and much ingenuity was exhibited in attempts to attain this end. But, while all methods resulted in many excellent recoveries, those baffling cases in which non-union occurred continued to be reported. These failures gave the "bone carpenters" their chance, and technique in bone grafting, wiring, pegging or clamping of fragments, reached high standards.

Then came the Great War. The vast numbers of cases, the majority compound, comminuted and nearly always severely infected, provided a large field for further study. Our own Corps was well to the fore here, and the names of Maurice Sinclair, Pearson and several others will go down in the history of surgical endeavour for the excellence of their methods of treatment. I feel that I can say with confidence that, at the present time, the results of treatment of fractures in the Army can compare more than favourably with the results of such injuries treated in civil life. Of course, most of our cases are fit young men, and all of us appreciate what necessary adjuncts bodily health and vigour are if a fracture is to unite. But—there is still room for improvement.

Where cause and immediate effect are so obvious, empiricism should find no place in treatment: our methods should be based on knowledge of established facts, and backed by experience. Great strides have been made during the last few years, and while the advances can be put down largely to the increase in specialism and in fracture clinics and depart-

ments, a better understanding of the physiology of ossification, and pathology of bone growth, has contributed most. Without some idea of this rather complex but most interesting subject, we must be working largely in the dark. I shall endeavour to attempt to present to you some of the facts and theories relating to the subject as succinctly as possible, merely accentuating main points. Let me state here that I shall quote almost entirely from "Surgical Pathology" (Illingworth and Dick) and Hey Groves' translation of Bohler's book on "Treatment of Fractures."

Most bones are developed from a previous model in cartilage, the process of normal ossification taking place in a constant order for each bone, at constant age-periods, from what are known as centres of ossification. If we take a typical long bone as an example, it consists of a shaft (or diaphysis) and two extremities (or epiphyses) and occasionally accessory prominences (or apophyses). There is a centre for each such subdivision and during the process of growth the epiphysis is separated from the diaphysis by a zone of hyaline cartilage, the epiphyseal cartilage or plate. Except at its articular ends the whole bone is clothed by a fibrous vascular membrane—the periosteum, which is attached most firmly round the growing bone at the region of the epiphyseal cartilage. From the point of view of the pathologist in particular, one of the most important areas of a growing bone is the metaphysis, or area of the shaft, immediately adjoining the epiphysis. It is here, during the period of growth, that the circulation is richest and where the vascular spaces are numerous, thin-walled and dilated, so that they are particularly prone to injury and congestive stasis, and form a ready trap for infective organisms circulating in the blood. This is the area in which acute osteomyelitis almost invariably commences. Growth in any tissue is dependent on an adequate blood supply. Blood in the case of a bone reaches the zone of growth, not only by the nutrient vessels but also from the periosteum and from an intimate periarticular anastomosis.

It should be remembered that cartilage does not ossify, but merely provides a cellular matrix for the formation of the necessary embryonic type of connective tissue (mesenchyme) in which ossification takes place by replacement.

The roll of the skeleton is not merely supporting. It acts as a storehouse for the elements calcium and phosphorus—both essential to life—and keeps these substances at a constant level in the blood-stream, a state of chemical equilibrium in which the secretions of the pituitary and parathyroid glands and vitamin D play a directing part. It is most important to keep in mind that bone is not an inert immutable framework but a living tissue, liable to modelling and remodelling processes to meet the stresses imposed by muscle pull and gravity, and capable of repairing the damage resulting from disease or trauma.

The roll of the periosteum has long been a subject for discussion and argument, but most observers now agree with Macewen of Glasgow, that

this membrane should be regarded as a "limiting barrier to ossification." Foremost among the issues in this "battle of the periosteum" is the function of the osteoblast. For a long time it was believed that the tissue bone was the result of the specific vital activities of the osteoblast, and that in the absence of osteoblasts no osseous tissue could be formed. A majority, however, now consider that the function attributed to the osteoblast alone can be assumed by any primitive mesenchymal cell, under certain conditions of environment. This, the theory of Lariche and Policaard, denies the existence of a specific bone-forming cell, while maintaining that bone, cartilage, and even fat and tendons are the derivatives of a process of metamorphosis (metaplasia) in primitive mesenchyme, whereby the cells are "adapted" to suit the local needs and functional requirements, basing their belief on the study of a large amount of anatomical and pathological material.

The champions of the theory maintain that bone formation must always occur in such primitive tissue which they designate an "ossifiable medium," provided that there is an adequate and readily available supply of calcium salts and that certain other factors, depending on conditions of blood and lymph circulation, are favourable (viz. the presence of the ferment phosphatase and the correct pH value in the serum). To sum up, all changes preparatory to the formation of bone depend on local adjustments of the circulation, its calcium content, local pH value, etc., and are quite independent of the presence of osteoblasts. For example, it is known that bone may form in scar tissue in the abdominal wall (some distance from the nearest bone), in glands (parotid), in muscle ("rider's bone"), and even in the walls of aneurysmal sacs.

Bone resorption (atrophy or osteoporosis) takes place as the result of the physico-chemical process called "halisteriasis" in which calcium salts are withdrawn by the body circulating fluids through the agency of the large foreign body type of giant cells called osteoclasts.

How do these theories fit into our mental picture of what happens during the healing of a fracture? The injury occurs, the local soft tissues are lacerated and contused, the bone is fissured or comminuted, and ruptured blood-vessels permit extravasation. The area of the fracture becomes "the fracture sac" in which the blood sooner or later clots. In the course of a few days the clot begins to organize, and becomes replaced by granulation tissue, or in other words young connective tissue of primitive type. There is traumatic inflammation with hyperæmia; the hyperæmia and protective disuse of the part result in bone absorption, greatest in the fractured ends, with liberation of a local excess of calcium salts. As organization proceeds the inflammation subsides and there is the usual slowing up of the circulation in the area (œdema), due to the fact that the new local blood system is not yet properly established. Now we have the correct conditions for fresh deposition of calcium salts, and so primary, and later secondary, callus is formed. Still later, under the stresses of the pull

of muscles, once more brought into use, of gravity, and weight-bearing, the secondary callus is remodelled into something permanent, which in a well-treated fracture may well be indistinguishable from the segment of the bone as it was before injury.

Under normal conditions callus begins to appear about the tenth day, and is complete in approximately twenty-one days. Consolidation of callus varies in different sites, but in weight-bearing bones it may well take four to six months.

The study of bone pathology enables us to arrive at—*inter alia*—two conclusions which are of importance to us when considering fractures, and upon which it is possible to formulate *two most important principles*.

(a) That *increased circulation* (hyperæmia) practically always leads to *bone absorption* (osteoporosis, halisteriasis). Examples: Bone in the early stages of acute osteomyelitis; the ends of fragments in a fracture fourteen days after the injury; the zone of bone immediately adjoining a vascular new growth, etc.

(b) That *circulatory stasis or congestion* or œdema, will lead to *bone sclerosis, particularly if the stasis follows a period of hyperæmia*. Examples: the ends of fragments of a fracture in the later healing of a fracture; the density of bone in an involucrum, or adjoining a chronic pyogenic bone abscess.

It is on the study of the mineral (calcium) salt concentration, as evidenced by the density of shadow cast on X-ray films, that we are able to watch and “check up” the progress of healing in fractures.

NON-UNION IN FRACTURES.

I have already alluded to this type of case as “baffling,” but with the more complete knowledge of the subject that we now possess, the element of mystery surrounding such an untoward result can usually be completely eliminated. We learn by the study of our failures.

Briefly the causes of non-union can be tabulated as: (1) General; or (2) local.

(1) *General causes*.—Under this heading come such conditions as pre-existing systemic disease (syphilis, rickets, etc.) and avitaminosis; blood diseases, etc.

(2) *Local causes*.—Mechanical: Interposition of a formed tissue barrier (viz. strip of muscle, fascia, periosteum, or a sclerosed and semi-detached fragment); over-extension; non-apposition of fragments; actual bone loss.

Non-mechanical: Retained sepsis; persistent inflammation (hyperæmia) due to retained foreign body (such as a bone plate); excessive movement; injury to the principal local blood supply; pathological causes (unsuspected tumour or bone cyst, etc.).

TREATMENT.

With the time at my disposal I can deal with treatment only on general lines.

Every fracture should be regarded as a surgical emergency. First aid is necessarily limited to relief of pain and shock and to the application of any available means of steadying the fragments until such time as the case can be got to hospital, thoroughly examined, and appropriate treatment initiated. Radiological examination is important and in most cases an absolute necessity.

The essential problem in the treatment of all fractures is the provision of a substitute for the damaged skeletal support; this substitute must be capable of maintaining the fragments in their reduced position, immobilized until such time as union shall occur, and functional recovery be well advanced. I propose to attack the problem under the headings: (1) Reduction; (2) retention; and (3) recovery of function.

(1) *Reduction*.—Naturally our aim is to replace the fragments as accurately as possible. The great bar to accurate reduction is muscle spasm. Every movement in a recent fracture causes pain and the pain produces reflex spasm in the adjacent and related muscles. This is a protective mechanism.

Muscle spasm is caused only by pain, and can be prevented if pain be abolished. Efforts at reduction should therefore be made under the influence of anæsthesia, and whenever applicable, local anæsthesia is far the best form to use. It is also remarkable that the very great shock that results from severe fractures can be eliminated within a few minutes by infiltrating the fracture area with a local anæsthetic. We all realize that accurate reduction is most difficult to attain in certain fractures, even after repeated attempts controlled by screening, but only in a very limited number should it be found necessary to resort to open reduction in a simple fracture. Apart from the special problems which arise in a particular fracture, it is useful to keep in mind that in the case of limbs the fragments will align best when the limb is in a position half way between flexion and extension, and that in the region of ball-and-socket joints the longer distal fragment will usually have to be brought into alignment with the shorter proximal fragment under control of a group of muscles, the combined action of which, when lacking the resistance they normally expect, is to displace the fragment mainly in one direction.

(2) *Retention*.—Whereas reduction may often be easy, retention is always difficult. Even when reflex spasm has been abolished we still have to deal with the normal tone or tension in the muscles; a property which results in the "taking up of any slack" when their normal tension is disturbed by lack of apposition, or insecurity of normal attachment or insertion. This, so called "adaptive shortening," causes contractures, and will cause displacement of fragments or angulation at the site. Retention must therefore be not only constant, but prolonged. It is usual to have to continue immobilization in a fracture of the radius for six weeks, or of the tibia, for ten weeks, when progress is quite normal.

(3) *Recovery of Function*.—This is the goal to which all our efforts are

directed. There is little merit in firm union without recovery of full function. Function implies usefulness, and without recovery of usefulness any method of treatment is useless. We know that an inflamed limb is painful, and that it is held naturally in a position of rest; without fixation, a broken limb remains painful, not only at the site of fracture, but at the related joints. Fixation and immobilization of a limb lead to "disuse atrophy": there is lymph-vascular congestion, absorption of the substance of the muscles, and extraction of lime salts from the bones. But, if complete fixation can be accompanied by as much active movement in the related joints and muscles as can be undertaken without causing pain, then one can be sure that function will be very soon recovered when the fixation is discontinued.

With reference to this problem, Bohler states: "These conditions can be fulfilled by the proper arrangements of technical apparatus . . . it does not matter whether it is done by wooden or metal splints, plaster casts, traction apparatus or expensive moulded splints. It is only of importance that fixation should be effective and continuous and not removed too soon. The best, cheapest and most comfortable fixation-material for most fractures is plaster of Paris. A plaster exo-skeleton can be made to fulfil the function of the damaged endo-skeleton. Natural use of a muscle renders superfluous that poor substitute, massage."

Bohler uses unpadded plaster splints from the outset, and these may have to be changed as soon as they become loose after the subsidence of swelling. Under this splint the muscles are encouraged to move, the circulation being thus kept up to almost full pressure.

Padded splints, no matter how carefully applied, permit movement of the fragments.

The unpadded splint should always be applied without previous shaving or greasing of the skin.

In the case of the lower limb, an inset iron, distributing the weight to the proximal fragment, makes the splint ambulant.

Late After-treatment.—Within the first week or ten days, a plaster splint may require bi-valving because of traumatic œdema, but this can be prevented or reduced to a negligible quantity by elevation of the limb. Should the plaster become loose, it should be changed; one half is removed at a time and a fresh "slab" applied, the other side being changed as soon as the new slab has set.

Splints should never be removed too soon with the object of permitting local massage and passive movements. Pain will invariably be felt if this is done. Pain should be regarded as evidence of torture, and not as a natural feature in the process of recovery. Passive movements, particularly if they cause pain, will increase stiffness, not reduce it. With active movements the reverse is the case, and such volitional movements may be assisted, provided such assistance causes no pain.

Edema persisting after removal of splints may be quickly reduced by

the application of pressure bandages, such as zinc-gelatin or elastoplast, radiant heat, and massage.

Delayed or faulty union occurs even in simple fractures, as most of us know to our cost. According to different observers, the frequency of this occurrence is $\frac{1}{2}$ to 6 per cent. Strangely enough it happens most often in strong healthy males; the middle of the radius and lower third of the tibia are common sites. The causes are the same as those which lead to non-union.

In pseudo-arthritis the medullary cavity of each fragment becomes obliterated by sclerosed bone, the ends pointed and separated by a mass of scar tissue with defective blood-supply.

In dealing with this class of case, Bohler states that he has treated 12,000 of them and has never used any of the much vaunted internal medicaments. He believes that good normal food with adequate vitamin content is necessary, just as it is necessary to treat systemic disease if present. He operates on cases of pseudo-arthritis, exposing the fracture ends, removes sclerosed bone and scar tissue, drills each fragment diagonally in numerous places, and apposes them again, with or without a Woolf's graft. These measures, combined with careful immobilization, amount simply to the provision of fresh channels for a new blood supply to become established at the site.

COMPOUND FRACTURES.

Unfortunately, time will permit only brief reference to this class of case. I can merely mention the methods Bohler applies at his clinic.

In pre-Lister days, Volkmann estimated the mortality from compound fractures at 40 per cent, and it would not be far wrong to assume that apart from an odd case of shock, hæmorrhage, or embolism, the majority died from septic infection or secondary hæmorrhage. It is obvious that compound fractures must be regarded as emergencies. In the more severe cases the first indications will be to stop hæmorrhage and treat shock. The most certain way to accomplish relief of shock is to infiltrate the area with a local anæsthetic. The improvement in a patient's condition soon after this has been done is often miraculous.

Do not shave, scrub, or wash the area of the wound, simply remove gross dirt using a swab moistened with ether or spirit, and paint with tr. iodi. Carry out excision of badly damaged skin edges and muscle, preferably using a tourniquet. Bleeding points should be stopped by pressure or diathermy. Spare tendons. Approximate the ends of divided nerves by suture. When severed muscles retract, they leave undermined skin, and the wound may have to be enlarged; incisions for this purpose should be made in a longitudinal direction. Soiled bone edges should be removed with a sharp chisel or nibbling forceps. Loose fragments of bone should be removed only when severed from all attachments. On completion of this "debridement," treat the wound with iodine and then suture the

skin only, using tension relief incisions if necessary. Drain obvious dead spaces for forty-eight hours.

The fracture is now dealt with as if it were a closed one. Displacement is treated by screw traction, and plaster slabs, with "windows" applied, or transfixion pins are incorporated in the plaster.

No dressing is applied. The blood and serum escaping from the wound make an ideal dressing. Anti-tetanus and anti-gas gangrene serum may be given, according to the degree of soiling. To obviate undue swelling, the limb is elevated. Later, should it be obvious that suppuration is occurring, only enough sutures are removed to allow the escape of discharge under tension, and the drainage of deep pockets. Otherwise sutures are left *in situ* for three weeks. Should subsequent X-ray examination reveal sequestra, these should not be removed before three to six months.

The hospital in Vienna, where Bohler is chief of a skilled and experienced staff, treats practically nothing but cases of accidental injury. It is financed by the local insurance companies. The directors of these corporations were shrewd enough to realize that it paid handsomely to finance such an institution.

In my humble opinion the principles on which Bohler works are pre-eminently sound. I must refer you to Hey Groves' excellent translation of Bohler's book for the methods in which he applies the principles in treatment. I am also convinced that his methods should be generally adopted in the Medical Services of the Army. The fact that much of the apparatus used by the Vienna clinic, or modified by those working on the same lines, has recently been authorized as part of our surgical armament is clear indication that this is also the opinion of our Consultative Committee at the War Office. What a change from twenty years ago! May I quote from my Annual Surgical Report from a large station in India in 1921:—

"On a recent emergency visit to operate in a large out-station, the O.C. Hospital informed me that he had no thigh splints, Thomas pattern or otherwise. This seems incredible in a station, the headquarters of a Cavalry Brigade. On further inquiry, it turned out that he was not authorized (on paper) to stock a single Thomas splint."

Again, "With reference to the subject of fractures, I must report that I am still being faced with the problem of the treatment of fractures with incomplete union in bad position, in which every available means has failed to keep fragments in an extended and reduced position. In most of them the utmost ingenuity has been exhibited by medical officers in their efforts to splint and extend the fragments. The patients arrive here with the skin of the limb exhibiting blisters or pressure sores, due to the application of successive forms of retentive apparatus or strapping. The underlying cause of failure in these cases is the fact that in a hot climate, not only will various strappings and glues fail to hold, but the general and local vitality being low, from sweat-gland infection, etc., the skin blisters

and sloughs easily, so that each successive form or means of extension applied is only effective long enough to do harm, by permitting periodic movements at the fracture site. The remedy seems to be: (a) The immediate transfer of all such cases to a hospital where they can be dealt with by open operation (? save the mark!); or (b) the use of extension apparatus attached direct to bone."

This state of affairs impressed me very unfavourably, as I was fresh from experiences of war surgery, where equipment was available almost *ad lib.* Simple fractures were still being "plated" in those days. In some cases I got good results by the use of meat skewers, and knitting needles transfixing the bone fragments, and in one instance the local Ordnance Officer converted a metal saddle stirrup, into a very good calliper.

Some of us require to remember that a "particular fracture does not demand treatment on a particular splint (sealed pattern—Mark 4)," but that each fracture requires treatment on its particular merits. Sealed pattern splints still have their uses for first aid; there is no better splint in this class than the Thomas splint for use in the field. It is also the splint of choice for treatment of many leg fractures in the wards at a later stage. But, can we not say that we have now passed the stage of named and sealed pattern splints, and that the era of adaptable, mouldable, light and ambulatory splints, with transfixion wires and pins has come to stay? Bowlby stated that the mortality in the Great War from fractures of the femur alone (exclusive of those who died at home) was 40 per cent. It behoves us to consider seriously whether we cannot utilize these newer methods in the surgery of war. Provided that fracture cases were segregated in the earlier stages, I think we undoubtedly could. Our ranks will be swelled on mobilization with a generation of younger surgeons well trained in the later methods. Team work would be essential. I am not convinced that the objections usually put forward to the use of plaster of Paris in war surgery now apply. The objections are as follows:—

(1) Efficient extension is difficult to attain. With extension direct to bone, or transfixing pins incorporated in the plaster, this should not be difficult.

(2) Plaster becomes soiled by discharges. Agreed, but not a real objection. Can be prevented to a large extent by suitably protected windows, vaseline packing and cellophane paint. What about Winnett Orr's method in the treatment of osteomyelitis. Granted it is malodorous!

(3) Efficient application is difficult, time-consuming and requires long experience. I do not agree on the whole. Read the books, or Colonel Weddell's excellent article in the *Journal* of October, 1936. Any surgeon who has not by now mastered plaster technique will get nowhere.

No—I think the real difficulty will be with compound fractures, and how soon, and under what conditions, surgeons will be able to tackle them. Indeed—one is often tempted to wonder under what conditions all of us

will be working in the next war, now that the world's air arm has developed to such an extent.

I like to be an optimist, and somewhat of a visionary, and imagine that I see a Special Fracture Centre near the fighting line, with a number of teams working smoothly and methodically, and the cases being evacuated, each one with his damaged limb, comfortably immobilized in plaster, labelled for the base or home and "not to be touched or dressed during the journey" (unless swelling necessitates bi-valving the splint).

We can learn much from the inspiration of men like Bohler and Winnett Orr, and can improve our methods as we go. There is economy and comfort in the principles of immobilization with early active movement, and in the knowledge that a patient's own serum is a good and inexpensive dressing.

THE GENEVA CONVENTION AND MODERN WARFARE.

PRÉCIS OF A LECTURE GIVEN BY GENERAL SCHICKELE AT GENEVA TO MEMBERS OF THE INTERNATIONAL RED CROSS AND OF THE PERMANENT COMMITTEE OF THE INTERNATIONAL CONGRESS OF MILITARY SURGERY.

GENERAL SCHICKELE at the very onset of his paper asks whether in the light of modern warfare sick and wounded will be adequately protected by the existing provisions of the Geneva Convention. His answer is an emphatic "No"—and he considers that, if the Geneva Convention is not to break down altogether, the whole position should be reviewed anew. The weaknesses which exist have been mainly brought about by the mechanization of modern armies and by aviation. Mechanization gives increased mobility and this will lead to rapid attack, much larger fronts, with probably increased casualties. Medical units, however, will be still employed at the front and, as in the past, be easily protected by the Red Cross. Capture of front line units and hospitals at the rear may be more frequent.

Aviation, on the other hand, has completely changed modern warfare. There will hardly, even in a large country, be a single area which cannot be attacked by high explosives and by incendiary or toxic bombs (even by the spread of pathogenic germs). Many people hold the view that a country with a sufficiently powerful air arm could in a few weeks bring any other country to its knees. This may be open to argument; nevertheless, the consequences of any aerial attack in a future war has an important bearing on the care of the sick and wounded. As yet air defence is not equal to air attack. The more important zone of attack may be far back. There, especially, it will be difficult to gauge medical requirements, for neither the objective nor the extent of the attack can be foretold. The casualties will be largely amongst women, children and old men, as presumably the majority of adults will have left for the front. Hospitals and medical units in a town so attacked cannot be protected, for though under cover of the Red Cross they might escape bombardment, they could not escape from the result of an extensive gas or incendiary attack, and therefore they, no less than medical personnel, may be completely thrown out of action and the work of collecting, transporting and treating sick and wounded will be wholly jeopardized.

Consequently, as any one country is able to cause untold destruction upon another, our wonderful civilization may yet be doomed unless nations stop to think before making use of all the engines of war they already possess.

Every nation wants peace, yet not one is ready to forsake the power of might. There will ever be too many imperative reasons, too many vital

interests at stake to justify a nation going to war whenever legislation fails to settle a dispute. The duty of medical services is to look after the sick and wounded, and as the Geneva Convention under conditions of modern warfare no longer affords that protection which it originally set out to give, General Schickele proceeds to see how its failure may be remedied, at least in the more important issues.

There is little to be said concerning the article dealing with the capture of the personnel of medical units. The Geneva Convention clearly lays down the rules to be observed, except that it would appear that a mistake has been made in preventing a pilot of an ambulance plane who has been captured and subsequently released being again allowed to function as a pilot of a war plane. He should be treated in the same way as any other driver of medical transport. He considers, too, that all non-uniformed personnel employed by medical services should be entitled to wear the Red Cross Brassard.

The last Geneva Convention grants protection to all soldiers temporarily employed by medical services, provided they hold due authority. In France, if captured, they are further protected by wearing a White Maltese Cross, which is an easy form of identification and one which might with advantage be adopted internationally. As far as possible, soldiers temporarily employed should be drawn from the non-combatant members of units, i.e., bandsmen, drummers, drivers, etc. Protection should likewise cover all supplies destined for sick and wounded, and if captured they should be returned.

In so far as the question of aggression is concerned, General Schickele thinks there is much to criticize. The title of the Convention reads "Convention for the protection of the sick and wounded at the front," thus excluding all sick and wounded at the rear and, therefore, all civilians. There is no doubt that had the original authors of the Geneva Convention foreseen the risk to which civilians would be exposed in modern warfare, they would have considered them as much entitled to protection as soldiers.

Protection is given to sick and wounded not only on the battlefield but during evacuation and their subsequent hospitalization. In modern warfare, the means of transport during evacuation must play an increasingly important part. Under the terms of the Geneva Convention, any form of transport claiming protection by the Red Cross must be solely employed in carrying medical material and personnel and/or in transport of sick or wounded. The Red Cross emblem must be clearly shown.

On transport belonging to medical units this is affixed permanently.

On transport borrowed from other formations it is affixed temporarily, and can only be shown whilst actually employed for sick and wounded, and provided it is covered by a special authority. General Schickele thinks the special brassard above mentioned might be brought into use.

It is also laid down that aeroplanes may be utilized by the medical

services, provided they be painted white, and duly show the Red Cross on wings above and below. This practically rules out the use of any other aeroplane being temporarily used in case of great emergency, as painting takes time. In modern warfare where distances may be great, the need for air transport may become more urgent than ever. The use of aeroplanes for sick and wounded should therefore be facilitated, not hindered. By all means let permanent ambulance planes be painted white, but other aeroplanes should be available for sick and wounded provided the Red Cross emblem is temporarily affixed in such a way as will make it easily discernible.

In touching on the subject of medical stores, General Schickele considers that all factories employed solely in the manufacture of dressings, sera, instruments, etc., should come under the control of the Geneva Convention, as such factories exist solely for the welfare of the sick and wounded. He thinks that it is an anomaly that such articles should be protected only when they exist as finished articles actually found in hospitals.

With regard to actual hospital sites or areas now so vulnerable to bombardment by air or long range guns, their protection needs to be viewed from an entirely different angle. It is obvious that a sudden aerial attack on any town will lead to such enormous casualties that the medical services, having had no opportunities to make previous provision for sick and wounded, will find themselves unable to cope with their task. Thus, the Geneva Convention which protects sick and wounded during collection and evacuation will cease to function as soon as they have reached their hospital centres. No doubt in time it will be possible to put up huttred hospitals, etc., but at the onset of an attack what is to happen? General Staffs, it can be presumed, will aim at a war of short duration so that a country may find itself suing for peace long before any measures to deal with its sick and wounded have been possible. Such a state of affairs has been fully discussed amongst military surgeons, and the only solution come to has been that nations shall agree to the formation of *special isolation areas* or *security zones* for hospital centres, even to the inclusion of whole towns set apart for that purpose. General Schickele points out that the Geneva Convention does not prevent such a step being taken, and that actually in the Great War such towns or areas on a small scale were brought into being.

The question of these security zones was openly discussed in Madrid in 1933 and subsequently again in Monaco in 1934.

It is fully realized that any abuse of such privileges as these areas or towns would enjoy would have to be guarded against. It was suggested that the areas or towns so selected should be notified either during peace time or during early hostilities and that at the outbreak of war they should be placed under the supervision of a "commission set up by non-belligerent countries" which would guarantee their absolute neutrality.

In the same way special areas could be selected at the front, but here

their previous notification would not be necessary as the Red Cross emblem could always be made visible.

Only in such a way will it be possible in a future war for sick and wounded to be cared for with any degree of safety. It follows that civilians and soldiers would benefit alike by such a scheme.

General Schickele finally lays stress upon the need of the Geneva Convention extending its protection to all societies attending sick and wounded, not merely to those affiliated to armies.

The Red Cross, universally recognized and respected by the whole world, is strongly protected by the laws of the Geneva Convention. Originally it was intended to be the distinctive sign to be worn by military medical units (Article 19).

Articles 20 and 21 say that under certain laid down conditions, the Red Cross cannot be utilized unless authorized by a special military authority. Why then does Article 24 say that in peace time the same emblem can only be used with the authority of a Red Cross Society. This anomaly should be removed as the use of the Red Cross should not be controlled by two different authorities.

General Schickele passed on to the question of Sanctions. He thinks those laid down at Geneva were of inadequate value, and that all violations should be referred to the International High Court of Justice by the "Commission set up by non-belligerent countries who in their security would be best able to give impartial evidence." Imperfect as this might be, no nation, however, would welcome open censure by such a committee, at least if it valued its national honour.

General Schickele feels that the Geneva Convention should be applicable to all civilians. He realizes that civil wars have no laws. This is no reason why an appeal should not be made to both sides to accept the Geneva Convention in the same spirit as nations warring against each other are prepared to do. There is no one who would not welcome such a possibility at this time when Spain is being torn mercilessly asunder.

REPORT ON THE LEAGUE OF NATIONS' COURSE ON MALARIA HELD IN SINGAPORE.

By MAJOR W. J. F. CRAIG,
Royal Army Medical Corps.

THE Course included theoretical and laboratory study at the Medical College, Singapore, and about twenty-five field demonstrations in and around Singapore and in Johore. The teaching covered the following eleven subjects :—

I.—ENTOMOLOGY.

Three hours a day for twenty days was devoted to this subject. The whole of the instruction was given by Professor B. A. R. Gater, M.C., Professor of Biology in the Medical College.

The points brought out in the lectures that seemed most important were : The wing venation terminology ; the longitudinal veins of my earlier acquaintance were discarded and the names used by Christophers and Barraud, viz. subcosta, radius 1, radius 2 and 3, radius 2, radius 3, radius 4 and 5 ; media, media 1, media 2 ; cubitus, cubitus 1, cubitus 2, and analis were used instead. The cross veins were named humeral, subcostal, radial, sectorial, radio-medial, and radio-cubital.

The wing scaling was another matter particularly stressed by the lecturer, as he bases his classification of anopheles in part on the variations of dark spots and pale areas of the wing.

In the description of the larva, the demonstration of the protrusible "notched organs" in the thorax which are characteristic of all anopheline larvæ was of interest. Attention was also particularly directed to the posterior clypeal group of hairs and to the sutural and trans-sutural hairs of the head which are used, together with the thoracic pleural and the abdominal palmate hairs, to enable a rapid identification of the different species of anopheline larvæ to be made.

The classification of the family culicidæ was gone into fully, that based on the work of Edwards in 1922 being used. The somewhat clumsy method of Swellengrebel and Rodenwaldt of 1932, employing the terms "groups" and "super species," was also mentioned as this classification is used in the Dutch East Indies. It was also interesting to note that there is now a tendency to attach importance to the maxillary index as a means of distinguishing between possible malarial anopheline species and non-malarial. This index is based on the number of teeth on the maxilla ; fourteen is taken as the dividing line, and those with less than fourteen are found to be man-biters, whilst those with more are animal biters.

A considerable number of the lectures was devoted to the ecology of the anopheles mosquito, and a great many references were made to recent experimental work which has been and is being done in the effort to learn

more about the life history and habits of the mosquito. The points brought out which were of interest in so far as they concerned the anopheles of Malaysia were: in Malaya a mosquito flight range of half a mile is considered the maximum effective range of the insect; in the Netherlands East Indies a control area of one and a half miles is considered necessary. In the latter country *A. sundaicus* (formerly called *A. ludlowi*) is the chief danger, and this mosquito is strong on the wing. In Malaya the most dangerous mosquito is *A. maculatus*. This species likes the clear seepage water of lightly shaded valleys for breeding in, just the ones provided for it by rubber estates. Seepage is plentiful owing to the almost daily showers of rain which raise the water table. The adult insect is apparently most active in a humidity of over 80 per cent. Indeed, in a humidity as low as 65 per cent it cannot survive more than a day or two. In Malaya Professor Gater has listed some 34 species of anopheles and 6 or 7 varieties: of these, only 3 are held to be important carriers, viz. *A. maculatus*, *A. umbrosus*, and *A. sundaicus*, while 5 more have been found to be infected in Nature. In the Dutch East Indies the same species practically are the proved carriers. It is noteworthy that although there are no marked seasonal changes in Malaya, yet there is a marked seasonal prevalence of all the commoner species of anopheles which is not the same for all, but the *A. maculatus* peak, which is in March, is followed closely by the parallel curve of malaria incidence. The species of anopheles which are only to be found in the Malay Peninsular are *A. asiaticus*, *A. wellingtonianus*, *A. watsoni* and *A. aurorostris*.

The first part of the laboratory course was devoted to external anatomy; this was followed by several days of study of the internal anatomy of the anopheles mosquito and dissection, including the dissection of infected insects. The larva was then studied in detail and a method of identification was taught, using for the purpose Professor Gater's "Aids to the Identification of Anopheline Larvæ in Malaya" (p. 52 *et seq.*), published by the Government Printing Office, Singapore, price one Straits dollar. For the identification of adult mosquitoes the class used a key produced in the form of a trial table for rapid identification.

Valuable hints were given relating to the technique and apparatus recommended for the collecting of adult mosquitoes and larvæ and the rearing of larvæ. A number of copies of *Bulletins* from the Institute for Medical Research, Federated Malay States, and Reprints from the *Transactions of The Royal Society of Tropical Medicine and Hygiene* were issued showing the trend of the most recent experimental work going on in the subject.

Dr. R. Green, of the Institute, provided a most illuminating demonstration of malaria parasites in the monkey, bird and human being in a long series of slides which included a demonstration of oocysts in the mid-gut stained by a method which he is perfecting but which has not yet been published.

For dissecting the insect and identifying the adult each member of the class had a new binocular microscope of the Greenough type which gives stereoscopic vision. For larval work the monocular instrument used for hæmatology was used. With the binocular instrument a dissecting lamp was provided for illumination; this was a gas-filled bulb with daylight equivalent glass fitted to a flexible arm and provided with a reflector.

For use with the monocular microscope, both in this class and in the protozoology class, an extremely good type of microscope lamp was used. This lamp is a modification of a type suggested by Gordon and Welch. It consists of a 100 watt projector bulb (with a concentrated filament) which can be burnt cap down in any position within 45° from the vertical. The bulb is contained inside a double casing which prevents light entering the eyes and provides a large cooling surface with plentiful aeration. In the front of the outer casing is an adjustable sleeve which carries a glass rod specially selected for freedom from "bubbles" and faults, and finely ground on the end nearest the bulb. The sleeve is moved by means of the slide to which it is attached, so that the rod is exactly opposite the concentrated filament. The rod is then moved in and out until the outer end is seen to present an evenly illuminated area. A spot of intense and practically uniform light is then available which can be focused by the substage condenser, the outer end of the rod being used as the source of light. A light filter "neutral" or "daylight equivalent," e.g. for blood work, or both, is placed in the carrier which is clasped to the end of the glass rod. The apparatus is not difficult to make and could probably be constructed locally anywhere.

II.—HÆMATOLOGY AND PROTOZOOLOGY.

In this class of seven lectures and seven two-hour periods of practical laboratory work, Dr. G. V. Allen gave the lectures and Dr. H. O. Hopkins the laboratory instruction.

This was a very valuable series of lectures despite the fact that the lecturer only reluctantly decided to make the course a résumé of the whole subject rather than confine himself to recent advances in the subject, because some members of the class were probably not engaged in laboratory work and might want their knowledge of the subject revised and brought up to date.

The points brought out in this class that claimed attention as being recent knowledge were as follows: *Plasmodium ovale*, which was first described by Stephens in 1922, has now apparently been recognized as a separate species. Its morphology is not altered by successive passages and it can only be identified in thin films when contrasted with *P. vivax* from which it differs in having a smaller number of merozoites, in that the red blood-cells are very often oval in shape and their margins fimbriated, and in the brown black colour and granular nature of the pigment and so on. The lecturer was able to get a blood slide with

P. ovale through the agency of the League of Nations and demonstrate it to the class.

The pigment produced by the parasite is now being employed in certain interdermal reactions (such as Rocchi's Test) as a test for the presence or absence of infection. This test is claimed to give a positive skin reaction in the majority of non-malarial and cured cases and no reaction in malaria cases. The formula for the pigment is given as C 84 H 152 N 20 Fe 0.82, but how it is prepared for the test is not stated.

Recent and detailed knowledge referring to such matters as the differences in the character of the pigment in the four different species of plasmodium in the oocyst, the Maurer's spots in the cells containing *P. falciparum*, the Ziemann's stippling seen in those containing *P. malariae*, and the Schüffner's dots of *P. ovale*, all were discussed. The many facts, also, learned in recent years from the use of the malaria parasite for therapeutic purposes such as the differences, clinical, immunological and biological between Indian and Italian strains of *P. falciparum*, and the more accurate knowledge of the incubation period were mentioned. Culture methods and blood changes in malaria were both dealt with in this course of lectures.

The outstanding features of the laboratory course were the use of Shute technique for the staining of malaria parasites, both for use with Leishman's and Giemsa's stains; and the use of defibrinated blood films in examining blood for malaria parasites.

By means of the Shute technique we were enabled to bring out the various spots and stippling of the different species of the plasmodium at the first attempt. The technique depends principally on the adjustment of the distilled water to a suitable degree of alkalinity by the addition of lithium carbonate and on the testing of the methyl alcohol. The method is described by S. P. James, in the *Transactions of The Royal Society of Tropical Medicine and Hygiene*, xxiii, 269, of 1929, and again in an Addendum to the same article circulated privately.

Defibrinated blood films offer a means of obtaining the highest possible concentration of parasites on a film. The method is to take three or four cubic centimetres of blood from a vein and quickly introduce it into a small, clean, dry test tube containing a few glass beads. This tube is then shaken gently and continuously for three or four minutes, whereupon the defibrinated blood is poured into a small centrifuge tube, leaving the fibrin clot behind in the tube with the beads. The red cells are packed by spinning for a few minutes and the supernatant serum pipetted off. A drop of the centrifuged red cells is put on a slide and spread into a "thick" thin film, dried, and stained with Giemsa.

III.—CLINICAL.

As the Army Medical Service has its own large store of clinical material to draw upon for experience in this disease, it is not necessary to

describe this course in detail, particularly as there happened to be rather a dearth of clinical material in the Tan Tock Seng Hospital during the period, but in the lectures, Professor Hawes, with his great clinical experience, adopted a distinctly conservative attitude towards the use of the newer drugs, atebirin and plasmoquine, in contrast to certain of the other lecturers, who came from up-country estates and who were keen advocates of the use of these drugs in preference to the longer known drugs of the quinine group. Professor Hawes pointed out that there is a type of liver necrosis preceded by fatty degeneration in the central zone and spreading towards the periphery, which is found in blackwater fever and also when patients are treated with phenyl hydrazin? This fact should be borne in mind when liver poisons such as atophan, plasmoquine and atebirin are being used.

The low birth-rate associated with untreated malaria referred to by the lecturer is the reason why the indigenous Malay population is being out-bred by the Chinese immigrant population in Malaya. Is it not possible, therefore, that if preventive malaria measures were intensified in rural districts, the Malay population might become more prolific after a generation or two and so offset this disproportion. For although the Chinese are less immune to malaria than the Malays, they tend to concentrate in and around the towns where anti-malaria measures are more effective than in the villages and so they are proportionately less affected by malaria.

IV.—PATHOLOGY.

Dr. Tull, in his lectures, gave a very comprehensive account of the histology, physiology and pathology of the organs of the body, especially the spleen, liver and kidneys in so far as they are affected by malaria. This lecturer also stressed the similarity of a malaria paroxysm to anaphylaxis and was evidently inclined to think that the toxin is provided by the pigment. He also suggested that supra-renal insufficiency might be the determining cause of pernicious malaria, as the supra-renal cortex shows degenerative changes evidenced by the partial or complete loss of its normal yellowish colour.

V.—SYNTHETIC DRUGS.

This was naturally a most welcome series of lectures in view of the great interest that is now being displayed in medical circles in the use of the new synthetic drugs for the treatment of malaria. Dr. Green, who is one of the staff of the Research Institute at Kuala Lumpur, and an authority on this subject, confined himself in his lectures largely to Malayan experience. We had also the experience of the Formosan School in this matter through the kindness of Dr. Morishita, the Director of the Malaria Research Institute of Taihoku, who was a member of the class and who provided us with some of the publications of this institute which had a bearing on this subject. As the general literature on these drugs is

already so extensive it will suffice here merely to summarize the Malayan view.

Plasmoquine was the first drug dealt with; it is considered to have a specific action on gametocytes and in particular renders crescents non-viable. The present-day tendency is to reserve it for use as a prophylactic against crescents and as a means of preventing the infection of mosquitoes by humans; moderately large doses at three-day intervals will effect this. A dose of 0.03 gramme given daily over a period produces methæmoglobinæmia in some cases and such a dose cannot be given safely without supervision. Gametocytes of benign tertian and quartan malaria are destroyed equally well by quinine and atebryn, both of which drugs are less toxic than plasmoquine.

Atebrin, which has now been in use since April, 1932, appears to be much less toxic than plasmoquine and to be highly effective against the asexual forms of all species of plasmodium. Its dose is 0.3 gramme daily, either all at once or divided into two or three doses. It has a cumulative effect and is stored in the liver and tissues. It has been found in the urine up to thirty-six days after cessation of treatment. It is therefore unsuitable for prolonged administration; this, however, is less necessary as its cumulative action subjects the parasite to prolonged action and so the drug is very efficient in preventing relapses. As it has not the temperature-reducing properties of quinine it is now the custom in Malaya to treat a patient for the first two days of his malaria attack with quinine and then to continue with atebryn instead of quinine for the next five days. Atebrin should not be continued for more than seven days, because it is liable to lead to toxic symptoms which are often delayed for six or seven days after the atebryn has been stopped. These toxic symptoms consist of headache, abdominal pains and yellowish discoloration of the skin and whites of the eyes and, most important of all, cerebral excitation. This last takes the form of a delirium lasting from one to several days, during which time the patient is in a hilarious, excited state and is not accountable for his actions. On recovery he has no recollection of the period spent in this condition. A seven-day course has produced this effect. A research experiment showed that while the relapse rate with quinine treatment was 38 per cent, that with atebryn was only 4 per cent.

Japanese experience was generally in the same direction as regards these two drugs except that they found that plasmoquine had no power to prevent relapses.

The other synthetic drugs dealt with were Tetebrin, C 77, Fourneau 710, and Fourneau 852, of which only the last-named was considered to be effective.

Dr. Green also gave a lecture on the subject of bird and monkey malaria in which his conclusion was that cross infections of malaria from monkey to man were possible but far from common. The use of monkey malaria was permissible for tuition, as, for instance, the oocysts of

monkey-infected mosquitoes showed no structural difference, but for research monkey malaria was not sufficient and human controls in addition were required.

VI.—HISTORICAL.

Dr. Hoops gave a paper on the history of malaria. It was interesting to learn that Anna, Countess of Chinchon, from whom quinine received its name, cannot ever have taken the drug, because she apparently died in Spain before her husband ever left for South America as Viceroy of Peru. It was his second wife, Francesca de Ribera who was cured by quinine given her by the Viceroy's physician Juan del Vego. It was Linnaeus who gave the drug the name cinchona in 1742.

VII.—EPIDEMIOLOGY.

This course of lectures was given by Professor Walch, of Batavia, Dutch East Indies. In the lectures he followed mostly the work of Ross, Christophers, and Gill and MacDonald of the English workers; Schüffner and Rodenwaldt of the Continental; and Darling of America. For the mathematics of hygiene we were referred to Ferguson and Udney Yule.

The lectures on the comparative study of the spleen rate in endemic and hyperendemic malaria were of the greatest interest and for this purpose malaria in British India, the Dutch East Indies, South Africa and the Southern States of U.S.A. was taken for purposes of comparison.

Christophers' theory of the spleen rate was discussed in detail, and his work, along with that of Sinton and Covell in Section VII of *Health Bulletin*, No. 14, Government of India Malaria Bureau, was recommended to be followed.

VIII.—CONTROL.

To an officer belonging to such a service as the Army Medical Service with its predilection for preventive medicine it is natural that the subject of control should be held to be most important and an acquaintance with the malaria control work done in Singapore is necessary for anyone aiming at a complete knowledge of this subject. There is probably no one who has had a wider experience than Dr. Scharff in devising and carrying out underground drainage schemes and so the class was fortunate to have the benefit of his teaching both in his lectures and in the numerous outdoor demonstrations. In Singapore antilarval oiling is looked upon as a temporary measure, only to be carried out until permanent subsoil drainage in the area has been effected. Earth filling is expensive by comparison with draining and is not considered effective, though it is useful at times when soil happens to be available from engineering projects being carried out in the neighbourhood.

In brief the method whereby Singapore has almost eradicated malaria is by means of putting in lines of agricultural tile drains from 4 to 8 inches in diameter, according to size required by the flow, at a depth of from

4 to 7 feet below the surface, laid roughly along the line of the lowest contour of a valley above the height of the exit from the valley. These pipes, which are each 12 inches in length, are laid end to end against each other, leaving a space of about $\frac{1}{10}$ to $\frac{1}{4}$ inch between them through which the water enters from below. They are laid on rubble at the bottom of a trench to prevent silting and between the joints of the pipes a sausage of puddle is laid to prevent surface water, roots, etc., entering from above. The pipes are laid as straight as possible and an inspection chamber is placed where the gradient has to change to prevent scouring. The pipes are laid from the outlet backwards and the trench is filled in as soon as they are laid. Down the centre of the valley is laid a cement invert to lead off the surface water. This runs as straight as possible and into it the subsoil pipes discharge when they come to the surface at the bottom of the valley. The central invert consists of a curved cement invert one-third the circumference of a circle in shape with cement slabs leading back from the upper border of this at an angle of 45° . Unlike the subsoil pipes, these slabs and the invert sections are cemented together, but weep-holes are left open at the lowest points of the invert curve.

This system of drainage is particularly applicable in Malaya where the water table is generally less than three feet below the surface as the result of the constant rainfall throughout the year and the presence usually of an impermeable layer not far below the surface. These subsoil drains are just sufficient to lower the water table and so prevent the water out-cropping as swamps in the floor of the valley and as springs and seepages at the bottom of the sloping sides. It is just in such seepages of crystal-clear water that the anopheles, and particularly the dangerous *A. maculatus*, love to dwell.

In addition to Dr. Scharff's lectures, Dr. Demeny of the Asiatic Petroleum Company spoke on the chemistry of anti-larval oils and demonstrated spreading powers, etc., of different oils. Dr. Smart gave one lecture on propaganda, which is used extensively in this country. As a means of bringing knowledge of disease prevention to the villages, there are cinema films, health weeks at agricultural shows, visits from health officers, lady health officers, dressers on motor bicycles, travelling dispensaries, lectures at schools. Dr. Smart also dealt with special control measures such as brush spraying and oiling, bamboo subsoil drains, medical examination of labourers and measures applicable to temporary engineering contracts, sluice gates for flushing streams, the use of Paris green in such places as ponds in botanical or other ornamental gardens, and larvæ eating fish.

Dr. Wallace, who has much experience of estate work, lectured on mass treatment of cases and carriers. He had had on his estates good results with plasmoquine and its combinations with quinine, but few other workers had been able to confirm his results. He had also had good results with plasmoquine for three months after an initial five-day course with atebirin.

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He had not tried atebrin alone. In this case it was interesting that his parasite rate remained at *nil* for a month after the cessation of atebrin and then reappeared gradually although plasmoquine continued to be given for another two months.

There is already some evidence in the Third General Report of the Malaria Commission of the League of Nations (*The Therapeutics of Malaria*) that atebrin is a true prophylactic. There is also evidence of its sustained action up to something like thirty days, which is doubtless related to the slowness with which it is excreted, already referred to in Section V above. It would be interesting to see whether a five-day course of atebrin at intervals of six weeks would be sufficient to prevent both fresh attacks and relapses. The only drawbacks to such a method would be the occasional occurrence of a yellow tint in the skin and the possibility that the cumulative effect of taking the drug over a long period might in the end do damage to the liver. So far there is no evidence that this is likely to be so. The advantages are that the daily dose (0.3 gramme) can be taken at one time, and the total cost is small, the period of administration being so brief.

IX.—EXPERIMENTAL MALARIA, ETC.

Professor Ciuca, of Bucharest, who came from the Secretariat of the Malaria Commission of the League of Nations to carry out the administration of this course, gave a series of lectures on various subjects, including experimental malaria and the value of malaria therapy in the study of malaria, on experimental malaria and the study of malaria immunity and its contribution to the treatment of malaria, totaquina, bonification in Italy and the work of the Malaria Commission.

For instance, experimental malaria has enabled us to confirm the specificity of four species of parasite; it has established accurately the incubation period of malaria; it has verified observations on acquired immunity, e.g. that immunity to one strain of a parasite is not effective against another strain of the same species, and so on. As regards totaquina, the League of Nations' cheaper substitute for quinine, it is well established that Types I and II are both about equal to quinine sulphate in their efficacy.

Bonification has, by means of large scale drainage and cultivation, converted the Roman Campagna and other places in Italy from uninhabitable malaria swamps into populous and prosperous districts, the State and co-operative societies having advanced the necessary money for the work.

X.—MALARIA IN INDO-CHINA.

Dr. Morin, the Director of the Malaria Bureau of the Pasteur Institute in Saigon, gave a series of lectures on the above subject. The science of malaria prevention is still in its youth in French Indo-China, as it was not until 1929 that anti-malaria measures were taken in hand to any great extent. The chief reason for this was that jungle was hurriedly cleared in

many places for the purpose of planting rubber from 1926 onward, and this led to a bad malaria epidemic in 1928. Thus it is that even now the measures taken consist chiefly of oiling and surface drainage combined with quinine prophylaxis and by means of these measures a very fair measure of success has already been obtained.

The transmitting species of anophelines are *A. minimus*, *A. jeyporiensis* and *A. maculatus*. Dr. Morin illustrated his lectures by means of numerous slides and his detailed information, graphs, etc., are set forth in a book compiled by himself and Dr. Robin, who was a member of the class. The book is entitled "Essai sur la Prevention Pratique du Paludisme dans les exploitation Agricoles en Indochine" and is a publication of the Chambre D'Agriculture de l'Annam. Dr. Morin kindly gave a copy of this book to each member of the class.

XI.—MALARIA IN THE DUTCH EAST INDIES.

Professor Walch also gave a further series of lectures on malaria in his country. He, too, illustrated his lectures with numerous lantern slides, and so most of the time was speaking in a darkened room, but the points of importance he brought out were the following:—

Malaria is hyperendemic in many of the places in Dutch East Indies, but whereas the spleen-rate in most of the towns in these areas was from 80 to 100 per cent. in 1922, in 1932 the spleen-rate in the same places had fallen to from 0 to 40 per cent. The country is not swept by generalized epidemics but localized epidemics are common. The responsible mosquitoes are *A. sundanicus* (*ludlowi*), *A. hyrcanus* (*sinensis*) *A. maculatus* and *A. aconitus*. Control is for the most part on a big scale and consists in narrowing the river beds, deepening the creeks and rivers at their mouths, and building out piers to carry the stream out to the sea because these creeks are often blocked at their mouths by sand bars, and so the stream meanders along in a line parallel to the coast forming a swampy delta before it finds an outlet for its waters. Canals are also made to prevent lagoon formation. Rice fields are drained periodically; this simple method removes their dangerous larvæ effectively. The numerous fishponds in which fish are bred for profit were also rendered innocuous by making proper canals and sluice gates, through which the water could be drained off occasionally, and the aquatic plant which half filled these ponds, and afforded security for larvæ, killed and removed by drying.

XII.—GENERAL CONCLUSIONS.

In addition to the above summaries of the subjects listed in the Course, there was also instruction given in the form of cinematograph films, demonstrations, pamphlets, papers and discussions.

The course of study as a whole was a most interesting one and of great value to anyone concerned with tropical medicine. As will be seen from the syllabus it was very intensive, but this was due to the comprehensive

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nature of it and was no hardship as the lecture rooms and laboratories of the Medical College were so well adapted for their purpose in this climate.

The League's professed object in establishing the Course was to make malariologists of those who attend it, and for those who aimed so high, there could be little time for idleness or rest during the few weeks available. With only one or two exceptions the class consisted of malaria research workers and medical officers of health, who were selected by their countries or governing bodies to attend the Course. As was fitting, the class was international in nature and was composed of some 8 British, 2 Australian, 2 French, 2 Siamese, 2 Japanese, 2 Chinese, 5 Indians, 2 Straits Indians, 2 Straits Chinese Medical Officers, and 1 Chinese lady doctor.

My own object in applying for permission to attend the Course was a limited one. I had recommended a number of subsoil drainage schemes to the C.R.E. for the Changi area, then in process of extending, and I wished to learn the principles of anti-malaria subsoil drainage and their application, so that I could see these schemes carried out to the best advantage. That the course took me further afield I hold to have been no misfortune. One of the cinematograph films I mentioned above was produced by the Health Department of the Singapore Municipality and showed this drainage being carried out in all its aspects. Through the kindness of the Deputy Health Officer (Dr. Dawson) I was enabled later to take with me all the Royal Engineer officers, foremen of works and native overseers of labour who are concerned in the carrying out of these subsoil drainage schemes in Changi to see this film, and this demonstration was undoubtedly of benefit to both them and myself.

SOME ASPECTS OF THE PREVENTION AND TREATMENT OF VENEREAL DISEASES IN THE ARMY, WITH SPECIAL REFERENCE TO GONORRHOEA.¹

BY LIEUTENANT-COLONEL C. CRAWFORD-JONES,
Royal Army Medical Corps.

VENEREAL diseases in the British Army are treated in hospital, at any rate during their infectious stages; while in many other armies, and in most civilian populations, they are treated as out-patients, except when some immobilizing complication supervenes, such as severe bubo, gonorrhoeal rheumatism, etc. The policy of our Army authorities is to hospitalize patients suffering from venereal disease. Every genital sore arising from sexual intercourse is regarded as a potential syphilitic infection whether clinically resembling syphilis or not.]

The case is admitted to hospital and the sore cleansed with normal saline and scraped to obtain a specimen for dark ground examination. If the result is negative the sore is treated with saline and the dark ground examination is repeated on three successive days. And further, if these examinations are negative, a suitable gland in the inguinal group in the groin is chosen and punctured, and five minims of sterile normal saline are injected into the enlarged gland. By movements of the needle the gland tissues are broken down and a small quantity of the fluid is withdrawn and examined under the dark ground for *Spirochæta pallida*.

If all these procedures are negative, and suspicious clinical signs are present, the blood-serum of the patient is subjected to the Wassermann test at intervals of one week for four weeks, and later once a month for three months.

In this way very few cases of infection with syphilis escape detection and early treatment.

If the sore is frankly of the character of a soft sore, ragged, with undermined edges, painful and bleeding easily, it has been my practice for many years to cauterize it with camphenol. Camphenol is an oily liquid obtained by rubbing up equal parts of camphor and carbolic acid crystals in a mortar.

This procedure has a very definite effect in minimizing the incidence of inguinal bubo which used frequently to accompany this type of sore. A few days dressing with normal saline does not interfere with the subsequent dark ground examinations which will reveal the presence of *S. pallida* in cases of double infection. By this means many hospital patient days are saved during the course of a year.

¹ Extracts from a paper read before the Royal Society of Medicine (United Services Section).

The patient is kept in hospital until the sore is completely healed or, in the case of syphilis, until all clinical lesions are healed or until the patient has had at least three injections of arsenic and three injections of bismuth treatment, whichever occur last; he then continues the treatment as an out-patient.

Gonorrhœa cases are kept in hospital until they have been dry for at least one week, during which time they are subjected to the passage of a straight sound and a prostate massage. If they remain dry after this stimulation, and no organisms are present, they are discharged. But they are not lost sight of at this stage; follow-up treatment is continued in the shape of observation and prostatic massage once a week for a period averaging two months after leaving hospital.

PREVENTION.

We all know that syphilis is a waning disease, at any rate so far as the Army is concerned. We know that since the introduction of preventive-treatment packets syphilis has diminished enormously in severity and actual numbers, but in spite of various improvements in the type of preventive outfit, such as the inclusion of 0·1 per cent oxycyanide of mercury incorporated in the calomel cream, the incidence of gonorrhœa has not diminished *pari passu* with that of syphilis.

The reason appears to be that of those cases of gonorrhœa which give a history of having used this preventive treatment outfit, over 95 per cent state that the outfit was applied at varying times after coitus, the vast majority having used the outfit on return to barracks.

It is very rare to find a case of gonorrhœa who states that he has used his preventive treatment outfit before coitus.

The directions how to use the preventive treatment outfits state that the patient is to urinate in gushes, rub half the contents of the tube well into the glans penis, etc., and inject the other half into the urethra and massage it well down.

When we consider that the gonococcus very soon dissolves the cement between the columnar cells of the mucous membrane lining the urethra, and comes to lie beneath in the substance of the mucous lining, and how very numerous are the thousand and one minute receptacles the gonococcus can and does occupy, namely, the Crypts of Morgagni and Glands of Littre, it would appear that this present method of preventive treatment savours of having locked the stable door long after the horse has been stolen.

During coitus the vaginal fluid enters the urethra, carrying with it gonococci or the infection of syphilis. It is easy to understand how the gonococcus gains a foothold, and once beneath the mucous membrane, no amount of irrigation and applications on the surface of the urethra will eradicate it for a long time.

It is thought that the reason why we do not commonly find urethral chancre is because syphilis requires inoculation through some abrasion or

injury, however small, to obtain a foothold, and that the urethral secretion is inhibitory to the *S. pallida*, which is a very delicate organism.

To reduce the incidence of gonorrhœa the only safe preventive is the unbroken condom (which is nearly but not quite foolproof), care being taken not to infect the parts on its removal.

If the condom is not employed the preventive outfit should be used prior to the act.

TREATMENT OF SYPHILIS.

Workers in syphilology have many different methods of giving the various antisypilitic drugs in common use. For instance, some workers think the only method is very intensive arsenical treatment alone, followed at a later date by a course of bismuth in some form; others give both arsenical and bismuth treatment at the same time.

STANDARD ANTISYPHILITIC COURSE OF TREATMENT WEIGHT 140 LBS.

DAY	914	BISMUTH	INTRAMINE	
1	0.45 gm	0.25 gm	—	COURSE A.
8	0.45 gm	0.25 gm	—	
15	0.45 gm	0.25 gm	—	
22	—	0.25 gm	3 c.c.	
29	0.60 gm	0.25 gm	—	
36	0.60 gm	0.25 gm	—	
43	—	—	3 c.c.	
50	0.60 gm	0.25 gm	—	
57	0.60 gm	0.25 gm	—	
64	BLOOD TEST			COURSE B
65-84	4 WEEKS REST			
85-98	14 DAYS TREATMENT POTASSIUMIODIDE			
99-155	REPEAT COURSE 1-57 DAYS			
164	BLOOD TEST C.S FLUID			
165-205	SIX WEEKS REST			
206-219	14 DAYS POT. IOD.			
220-374	REPEAT COURSE A.			
	CEREBRO-SPINAL FLUID.			

FIG. 1.

Having reviewed a great number of venereal case cards from the Royal Navy, Army and Air Force, there seems to be great divergence of opinion as to whether the arsenical treatment should be given by the intravenous, intramuscular, or the deep subcutaneous route. Personally, I favour the intravenous route, giving the bismuth concurrently.

In order to standardize the treatment in the Army and give medical officers a lead as to a sound course of anti-syphilitic treatment that had been tried out over thousands of cases with great success, as judged by the infrequency of fatalities, the ultimate percentage of negative Wassermann reactions, and absence of recurrences, a table of standard treatment for the average case of a man weighing 140 pounds was prepared and published by the War Office in 1928, under the special direction of the Director-General at the time, Lieutenant-General Sir Matthew H. G. Fell.

Fig. 1 shows the main principles of this course.

Early primary cases of syphilis who have *S. pallida* present and in whom Wassermann and Kahn reactions are negative at the time of the first injection and remain negative are treated with Course A. Late primary and secondary cases are treated with Course B.

Of course special cases require separate consideration.

It will be noted that in Course A there are two series of injections, each consisting of 3.75 grammes of the 914 product, whereas in Course B there are four series of treatment spread over 374 days. I have included a drug called intramine on the twenty-second and forty-third days of each course. The principle involved is briefly as follows :—

When any complex colloidal substance such as the di-oxy-di-amino-arseno-benzol group is repeatedly injected into any animal, that animal will develop an antibody to the foreign substance. Fig. 2 shows a diagrammatic representation of the molecule of the basis of all the commoner drugs used in the arsenical treatment of syphilis. This molecule is inert, except for

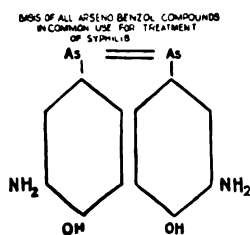


FIG. 2.

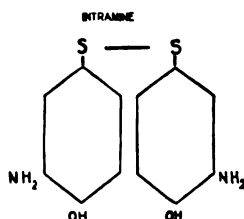


FIG. 3.

the amino groups or the hydroxyl groups, and the arsenic in these compounds is trivalent.

The antibody to the 914 preparation seizes upon the available amino or hydroxyl groups, and renders the molecule of 914 inert. When this inert foreign substance is circulating in the body, the liver and possibly the spleen, with their selective action, remove the substance from the circulation and proceed to break down the foreign molecule with the liberation of the contained arsenic, which is rapidly converted from a trivalent to a pentavalent form. The pentavalent forms of arsenic are sometimes more toxic than the trivalent. Hence, with repeated doses, an appreciable quantity of the arsenical drug injected is appropriated by the antibody, and thus it is not free to attack the spirochæte, and further, after disintegration in the liver, it is very apt to cause toxic arsenical jaundice, arsenical dermatitis and the like.

If the chemical constitution of the molecule of intramine is examined (fig. 3), it is found to be very similar to that of the common arsenical drugs, having the same amino- and hydroxyl group present, but sulphur as the connecting link between the two benzene rings instead of arsenic.

The antibody developed by the repeated 914 injections coming in contact with the intramine molecule seizes upon it and fixes its molecule in a

similar manner as in the case of the 914 molecule. This is sorted out by the liver, etc., and broken up, with the liberation of sulphur, which, being a reducing agent, will counteract the oxidizing properties of any absorbed toxic arsenic; and further, will continue with the antibody, leaving the 914 molecule free to attack the spirochæte, or to be eliminated.

Whether this explanation is true or not, the fact remains that in my own practice for the past eighteen years I have had remarkably few cases of intolerance of arsenical drugs; whereas before I included intramine in the standard course, jaundice, and even arsenical dermatitis of the exfoliative type were moderately common.

Should arsenical intolerance supervene during the course of treatment, the curative effect of sodium thiosulphate is well known. In cases treated with the *sulpho* compounds, it has been noted that the ordinary arsenical jaundice, urticarial and other rashes may occur, and, what is more serious, purpura hæmorrhagica may develop in varying degrees of intensity, and to counteract this a calcium thiosulphate preparation, such as calciostab, has been found to be most efficacious. 0.6 gramme is given intravenously, and can be repeated every twelve or twenty-four hours, as necessary. It should be given very slowly.

The patient experiences a sensation of heat or fire running throughout his veins, but beyond this no untoward symptom has been noted, and he is rapidly placed on the highway to recovery. It is considered that calcium thiosulphate is a very definite advance in our armamentarium against the toxic effects of arsenical drugs given in the treatment of syphilis.

TREATMENT OF GONORRHOEA.

There are two main methods of attacking gonorrhœa: (a) Local treatment; (b) general treatment.

(a) *Local Treatment*.—From the very pathology of the disease and the burrowing habits of the gonococcus, it is obvious that this method has very sharply defined limitations. It is considered that far too much attention has been paid to this side of treatment in the past.

Whether strong or weak antiseptics are used for irrigating fluid, or an individual inflamed gland of Littré is treated with caustic or other means, there are several hundred glands similarly infected, but not blocked and obviously infected. For the cure of gonorrhœa drainage is essential. But early instrumentations and irritating irrigating fluids can only be damaging to a delicate mucous membrane which will not support manipulation at any time without injury, still less when the cells lining the urethra are poisoned and devitalized by the gonococcus toxin.

So it appears that the logical attack on gonorrhœa must really be concentrated on the second method, namely general treatment. By this is meant attacking the gonococcus from within the body of the patient by aiding the natural force of antibodies, bringing the hydrogen-ion concentration

of the urine to the optimum value. For instance pH 7·2 is the optimum value in the case of the gonococcus which is most vulnerable at that value, but the majority of secondary organisms are most easily attacked at a lower value, 6·8 to 7·0.

Diet, exercise, mental contentedness, and general well-being all play their part in placing the body of the patient in the best condition to defend itself against gonorrhœa and its attendant complications.

VACCINE TREATMENT OF GONORRHŒA.

Some years ago Major E. C. Lambkin, D.S.O., R.A.M.C., and Major Lyn Dimond, R.A.M.C., introduced an exotoxin.

It was found that certain strains of gonococci grown on specially enriched media at a controlled hydrogen-ion concentration value developed Neisser positive bodies similar to the Babes' bodies produced by the diphtheria bacillus.

These bodies are loosely attached to the gonococci, and by a process of washing in saline and a high speed fractional centrifugalization a layer of them can be separated.

This product was found to be definitely antigenic, and was put up in vaccine form and administered intradermally with good results, but these were not so satisfactory as it was felt they ought to be.

Major G. F. Carr, M.C., R.A.M.C., working on the clinical side, and Major E. G. Anthonisz, R.A.M.C.(R.P.), working in the special research laboratory at the Royal Herbert Hospital, began investigations into the cause of the apparent failure of this special exotoxin vaccine.

It was very soon noted that in the microscopical slides prepared from cases of gonorrhœa many other organisms were present besides gonococci. These secondary organisms had long been known, and not very much attention had been paid to them.

Much work was done in isolating the various secondary organisms found complicating gonorrhœa.

The organisms isolated fall into the following groups :—

- (a) Gonococci. Numerous strains.
- (b) Staphylococci. Mostly *albus*, but some *aureus* strains.
- (c) Streptococci. The streptococci all conform to the same morphological and cultural characteristics, and apparently belong to the group "enterococcus." In urethral smears they almost invariably appear as Gram-positive diplococci; only very occasionally can short chains be seen. On solid media growth is copious and semi-transparent, contrasting with the denser and whiter growth of staphylococci. Stained preparations from cultures on the solid media are often indistinguishable from staphylococci, but may show a tendency to start chain formation. However, on subculture in a fluid medium, such as Hiss' serum medium, there is no doubt about the chain formation and the other characteristics of streptococci of the enterococcus group. Cases showing this type of secondary

organism with secondary infection almost invariably turned out to be very intractable, sometimes developing joint complications. An autogenous vaccine is very successful in these cases.

(d) Diphtheroids. In this group many different types of Gram-positive organisms have been found complicating gonorrhœa—cocco-bacilli, short thick bacilli, short thin bacilli which often are very weakly Gram-positive, and various longer types.

In the smear from the patient, the cocco-bacillus type appears to be the most prevalent; it is difficult to distinguish from the staphylococcus and the enterococcus type of streptococci.

Bacillus coli has only rarely been found.

It is interesting to note that in the very first and subsequent smears taken on admission, 70 per cent of fresh cases of gonorrhœa show the presence of secondary organisms.

Undoubtedly the best method of dealing with these cases of gonorrhœa is an autogenous vaccine in which the particular strain of gonococcus and the various secondary organisms isolated are represented.

Hence it is the aim of the Research Department of the Royal Herbert Hospital, Woolwich, to prepare a polyvalent vaccine which contains representatives of all the strains of gonococci likely to be met with infecting British troops in any part of the world, including different strains of the commoner secondary organisms.

The vaccine we are working on at the present time contains 26 strains of gonococci, 40 strains of staphylococci, 38 strains of enterococcal streptococci, and 60 strains of various types of diphtheroids; all isolated from cases of gonorrhœa.

The strength in which the vaccine is put up per cubic centimetre is as follows: Gonococci, 50 million; staphylococci, 500 million; streptococci, 500 million; diphtheroids, 500 million.

Hand in hand with the laboratory investigation, the clinical effect of vaccines, dose, interval between doses, of diet, exercise, and drugs to bring up the hydrogen-ion concentration of the urine, are all being investigated with a view to finding out the optimum procedure to be adopted in cases of this elusive and aggravating disease.

The results obtained so far are very definitely encouraging, especially from the point of view of effecting a real cure of the disease. But from the point of view of the administrators and the Treasury the real difficulty is to reduce the hospital patient days. Naturally, during the experimental phases, we cannot expect great results in this respect.

I should like to thank Colonel F. C. Sampson, D.S.O., late Officer Commanding the Royal Herbert Hospital, Woolwich, for his permission to publish a résumé of some of the work going on in the hospital when under his command. Also my colleagues, Major G. F. Carr, M.C., R.A.M.C., and Major E. G. Anthonisz, R.A.M.C. (R.P.), for their valuable assistance.

FILTERING AND CLEANSING APPARATUS FOR SWIMMING BATHS.

By MR. J. RUSSEL,

Electrical and Mechanical Officer, R.E. Headquarters, Southern Command.

THE usual method of maintaining clean water in swimming baths is to draw water out of one end of the bath and pump it through a filtration plant back into the other end of the bath. This is called the "turnover" system and the hours of turnover are said to be the capacity of the bath divided by the capacity of the pump. If the capacity of the bath is 120,000 gallons and the pump is 30,000 gallons per hour, the turnover is said to be four hours. It cannot, however, be assumed for a minute that every gallon of water goes through the filtration plant every four hours. The incoming clean water mixes with the dirty water already in the bath. Currents of water, vortices, and pockets of stagnant water form, and *some* of the water may not get to the filter in four hours, or in eight hours, or even sixteen hours. Attempts have been made to get complete turnover by varying the position of the inlet pipe or pipes to the bath and the outlet piping conveying dirty water from the bath; but these are not successful and there is no doubt that short-circuiting, and stagnation, takes place in all of these baths with the ordinary turnover method of dealing with the water.

I have designed a screen with the object of separating the dirty outgoing water from the clean incoming water. The screen consists of an inflated straight rubber tube floating on the surface of the water and a stiffener bar behind the tube keeps it rigidly straight and athwart the bath in movement. Rubberized waterproof cloth material is suspended from the inflated rubber tube and is wide enough to reach from side to side of the bath plus an overlap bearing against each side of the bath. It is deep enough to reach from the surface to the bottom of the bath at the deepest part plus a small overlap. The screen is placed at the end of the bath where the clean water comes in; when the pumping plant and filter are working the dirty water is drawn from the down-stream side of the screen and clean water is delivered into the bath on the upstream side of the screen. The screen thus forms a diaphragm between the incoming clean water and the outgoing dirty water. The screen moves along the whole length of the bath with the current of water. The time taken to move the whole length is the hours of turnover specified in the original filtration plant. The dirty water and sweepings in the last six inches or so of the run can be washed out through the scour valve to waste, instead of going into the filter. The screen can be run through at night or early in the morning before the bathers arrive, and at the end of the run the whole screen with floating equipment is lifted out of the bath. The swimming

bath can then be guaranteed to be full of clean water. The screen is dried out for further use later.

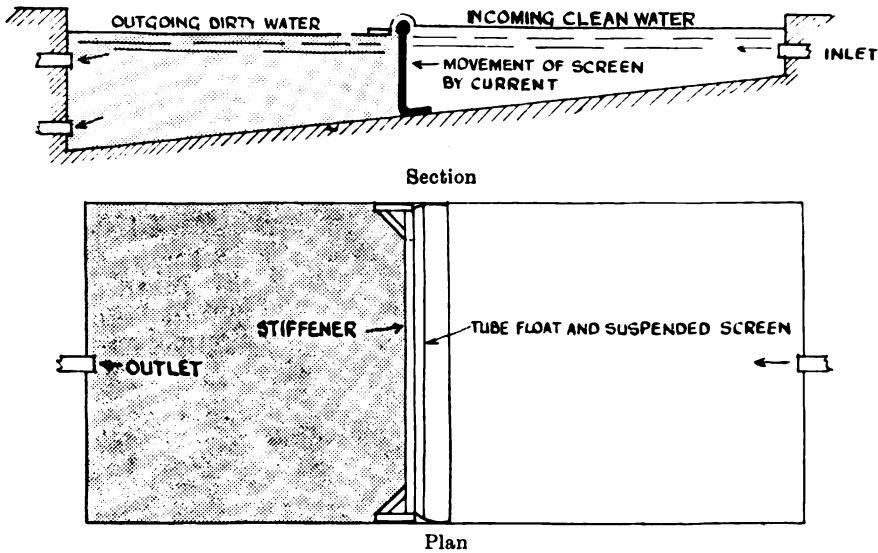


FIG. 1.—Movement of water with "Russel" Patent Cleansing Screen.

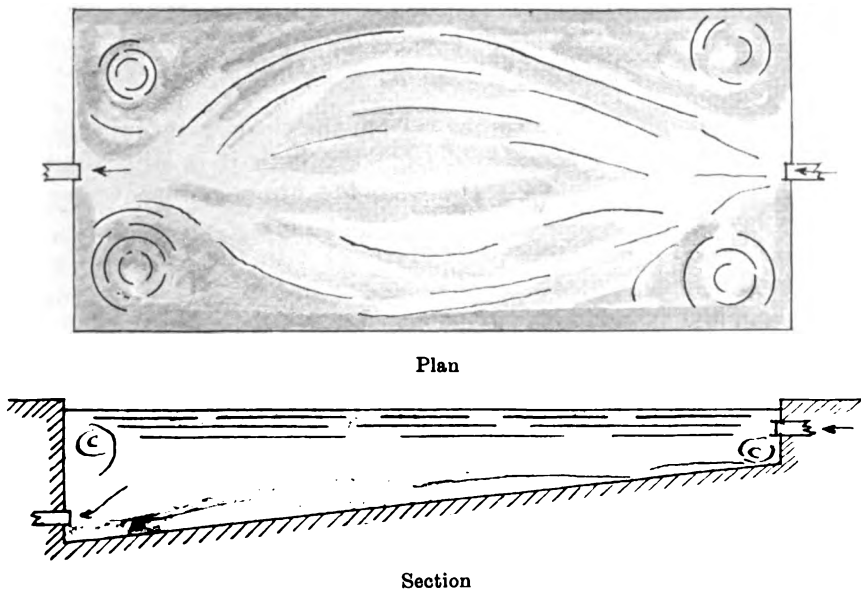


FIG. 2.—Currents of water with ordinary "turnover" circulating system (without "Russel" screen).

All filtration plant requires to be "washed" by water forced in a reverse direction through the filter to clear dirt from the surface of the sand filter.

When the turnover system of swimming bath water is used, it means that dirty water is injected into the body of the sand, which is objectionable. When the "Russel" screen has been run through the bath, however, the water is definitely clean throughout and can be safely used for the purpose of "washing" the filter.

In the diagrams, fig. 2 shows, roughly, the currents of water, eddies and vortices, with pockets of dirty water, that occur in the ordinary "turnover" system.

Fig. 1 shows the "Russel" screen in progress along the length of the bath. The incoming clean water on one side of the screen is separated from the outgoing dirty water on the other side of the screen.

In cases where the outlet pipe is not at the end of the bath, two screens are employed, starting from the ends of the bath and moving towards each other to meet at the outlet point. There are various alternatives.

The weight of the screen for a bath 32 feet wide is under 50 pounds, and the cost is about £35 or so.

The screen, as it wipes down the sides and bottom of the bath in transit, will remove any deleterious matter, such as mucus, which the ordinary "turnover" method does not do.

A saving in the running cost of the pumping service and chemicals is obtained, as a bath definitely full of clean water is provided at any slow speed of filtration required; there is no need to have *rapid* turnover with the object of getting the bath approximately full of sterile and clean water.

The screen can be run through once every twenty-four hours or less often.

Any small leakage that may occur is from the clean water into the dirty water. When the screen is removed from the bath it is still possible, if necessary, to run the pumping plant with the ordinary turnover system, during the day in case of overcrowding.

A full-size plant is operating (near Harrow) with the "Russel" screen, and is successful and very satisfactory.

The screen and system are fully patented.



Editorial.

CANCER.

THE thirteenth Annual Report of the British Empire Cancer Campaign was presented at a meeting held at the House of Lords on November 23, 1936.

At the request of the Grand Council the Report has been prepared by Mr. Lockhart Mummery.

Cancer research has received a series of heavy blows by the passing of its Patron, King George V, who took a close personal interest in its activities; by the death of the Chairman of the Grand Council, the Marquess of Reading; of Dr. R. G. Canti, Hon. Secretary of the Scientific Committees; of Lord Moynihan, President of the Yorkshire Council; and of the Earl of Yarborough, President of the Lincolnshire Council.

The work of the Campaign has, however, shown no abatement: knowledge has been extended in many directions, notably in researches on the changes in the cells which are associated with the genesis of cancer. A quite new feature has been the preparation by Dr. Stocks of a number of maps showing the distribution of cancer of various organs in England and Wales. An analysis of the half million of cancer deaths which occurred in 1921-30 has been made and the first results relating to the digestive organs, skin, lung and breast are illustrated in a series of maps.

The distribution of cancer of the œsophagus is shown in Map 1. Only male deaths have been studied as these greatly exceed the female deaths. Thus the standardized mortality of males was 64 per million in 1921-30 compared with 18 for females. Map 1 shows a definite region of high mortality at ages 25-65 in the South-East quadrant of England, for nearly every county in this area has a ratio above 100. Especially high rates are found in a crescent-shaped area north of the Thames.

Cancer of the stomach is shown in Maps 2, 3 and 4. There are two definite regions of high mortality, one extending from Wales to the north-west and extreme north of England, the other near to the Wash. The highest rates occur in Wales, the worst county being Caernarvon. The black shading of the counties in Wales makes a very striking picture, and reveals great contrasts in the distribution of œsophageal and gastric cancer.

Cancer of the intestines is depicted in Maps 5 and 6. Only female deaths are dealt with, as the mortality in the two sexes is practically identical. The distribution of mortality is seen to be much more uniform than for œsophageal or gastric cancer. The general conclusion is that though certain counties do exhibit significantly high or low mortalities, the local variation is much smaller than for cancer of the stomach and œsophagus and bears no relation to either.

Cancer of the rectum causes a mortality twice as great in males as in females and only figures for males are used for the preparation of Maps 7 and 8, which show the distribution of cancer of the rectum and anus. There is a more definite regional distribution than appeared for intestinal cancer. Norwich, Lincoln and neighbouring counties, also Norfolk and Middlesex, show a high mortality; they have a low mortality for gastric cancer.

The mortality figures for cancer of the liver, pancreas and gall-bladder, when plotted out, indicate that London and the Home Counties have low rates, whereas the North of England and the counties near the Wash, which are characterized by high gastric cancer, have mortalities above expectation.

Cancer of the skin has a curious distribution and probably the explanation is to be found mainly in the distribution of industry, and it is perhaps significant that most of the mining areas appear to have ratios above the average. Cancer of the breast is shown in Map 12. After correcting for urbanization, Wales has the lowest mortality, followed by the North of England, whilst the highest ratios occur in an area comprising Bedford, Cambridge and West Suffolk, and also in Herefordshire. Dr. Stocks considers that the local variation of breast cancer, though slighter than that found for other sites, is still of such a nature as to require explanation. He thinks it is unlikely that local differences in the proportion of single and married women, or of fertility, have an important influence in producing the distribution shown in the maps, and ætiological factors of another kind will have to be sought before an explanation is found.

The mode of origin of malignant cells has been studied by Dr. A. Haddow, of the Bacteriological Department of the University of Edinburgh. He enunciates a remarkable theory. He states that all available evidence shows that the origin of cancer is usually the result of changes in cells at one time normal, and that malignancy appears as the result of transformation and not of a selective process. The cancer cell must therefore be regarded as a variant of its normal prototype, differing from this in the character of growth-rate. In addition, the study of its behaviour during prolonged transplantation shows that the *type* of variant it represents is discontinuous, permanent, and irreversible. His studies of bacterial variation have led him to believe that the sources of variation are mainly environmental in origin, and no variation will occur in an organism placed in an optimum environment to which it is completely adapted. To induce variation there are two main requirements: (1) a cell which is inherently capable of variation in respect of that character; (2) a source of environmental interference with the character in question; but the interference must be so specific as not to produce serious changes in other characters or functions of the cell, it must be non-lethal.

Dr. Haddow directed special attention to the precise conditions which

govern the emergence of variants characterized by permanently increased growth-rate, and has found that these are produced, not by any process of growth-stimulation as might be expected, but appear as a sequel to a long-continued period of growth-inhibition. He wondered whether this conception might be applied to the new cell-race that constitutes a malignant tumour. He considered it suggestive that X-rays and gamma-rays of radium, which in certain circumstances are associated with the production of tumours, are possessed of well-marked growth inhibitory powers to which they owe their therapeutic action. He thought that the production of cancer by a physical agency of this kind might be due to a sustained inhibition of the normal cells leading to the emergence of a new variation possessed of permanently increased fission-rate. He therefore made experiments to see if the varied substances associated with cancer production might act in the same way. Some forty experiments were made which involved over one thousand tumour-bearing animals and the use of twenty related hydrocarbons, both carcinogenic and non-carcinogenic. The results obtained so far indicate a strong correlation between carcinogenicity and inhibitory power but the parallelism is not absolute. The effect is non-specific and inhibition can be demonstrated in young animals although it is relatively less striking. Most substances in a series of related non-carcinogenic compounds were found to be devoid of inhibitory power. No evidence has been found to suggest that the inhibitory power of the carcinogenic group is caused by a general toxic effect on the animal itself.

At the Mount Vernon Hospital, Northwood, Dr. J. C. Mottram has been investigating the origin of tar tumours in mice, whether from single cells or many cells. He has found that when calculations are made from the measured growth rate of the warts, which is remarkably constant, of the time required for them to grow from single cells to just visible warts, the periods of time required are comparable to the latent periods between the application of the tar and the appearance of the warts. If the tumours arise from single cells the period should be shorter for fast-growing warts than for slow growing; whereas if they arise from collections of millions of cells there is no reason why a fast-growing wart should not appear late or a slow growing one early. By plotting the growth rates of warts against their time of appearance after the beginning of tarring a very close relation was found; the fast-growing warts have a shorter latent period than the slow-growing varieties. The inference from this is that the cell changes, which result in the appearance of a wart from tarring the skin, begin in a single cell and not in a large group of cells.

At the Cancer Research Institute, Royal Victoria Infirmary, Newcastle-on-Tyne, biochemical studies on the metabolism of the cancer cell have been made. Warburg discovered some years ago that cancer cells have a very high aerobic fermentation, together with a respiration as extensive

as that of most normal cells. It is thought that this aerobic fermentation is connected in some way with the growth of the cells, but even in tumours respiration provides most of this energy.

In most normal cells there is little or no aerobic fermentation. It has been found, however, that the retina, and especially the medulla of the kidney, have a high rate of fermentation. The lactic acid formation in the kidney is almost as high as in malignant tumours, and this occurs when there is a vigorous respiration. These tissues are exceptional, but they do not turn their metabolic energy to the purposes of uncontrolled and disordered growth.

The basic difference between normal and cancer tissue metabolism is best shown by the respiratory quotient (R.Q.). The results obtained show an R.Q. of 1 for normal, highly glycolizing tissues, such as brain and embryonic tissues, and below 1 for highly glycolizing tumours, and feebly glycolizing normal tissues.

Classification based on respiration, rather than on aerobic glycolysis, proves to be more reliable as a method of distinguishing metabolism of tumour and normal tissues than the original view of Warburg that aerobic glycolysis was such a criterion.

In normal tissues the ability to oxidize carbohydrate is not impaired despite their high aerobic glycolyses. In tumours the incomplete or insufficient oxidation of carbohydrate is shown by the lowered R.Q.

The present position is summed up by the statement that the metabolic peculiarities associated with tumour growth are a combination of : (a) Aerobic glycolysis ; with (b) a lowered efficiency of carbohydrate oxidation indicated by a lowered respiratory quotient. While either peculiarity *alone* may be found in normal tissues, the occurrence of the two together seems at present to be a peculiarity of tumour tissue ; there being a general, though not entirely, clear-cut transition from normal tissues through benign to malignant growths.

At the Lister Institute Dr. Amies has been working on the particulate nature of the tumour—exciting agent in fowl sarcomata. Most of the experiments have been carried out with a Baskerville centrifuge by means of which a speed of 15,000 revolutions per minute, equivalent to 20,200 times the force of gravity, is obtainable. It was found that this force would deposit the whole of the tumour agent from an active cell-free extract ; and that the whole of the tumour agent thus removed could be recovered from the deposit so obtained. The crude deposit contains in addition to the tumour agent itself much finely-divided tissue debris. By repeated fractional centrifugation this extraneous material can be eliminated and a suspension of the agent obtained which is quite free from fowl-protein. This suspension shows no flocculation when mixed with a hyper-immune rabbit anti-fowl serum. Typical tumours leading to the death of the animal in twenty to thirty days have frequently been obtained

by injecting 0.25 cubic centimetre of 1:1000 dilution of such a suspension. The sarcomata produced by the purified agent are histologically indistinguishable from those produced by crude extracts of filtrates.

By means of collodion membrane filtration the size of the infective particles of Rous No. 1 Sarcoma has been found to be 0.0001 millimetre. Particles of this size can be seen by dark-ground illumination. Tumour-agent suspensions when so examined are found to contain large numbers of particles of apparently uniform size and density. Such particles are not found in the non-infective supernatant fluids obtained by high speed centrifugation of tumour extracts. Control suspensions prepared from normal spleens contained only small numbers of similar particles. The particles seen in tumour-agent suspensions are agglutinated in specific fashion by the serum of tumour-bearing fowls, while the suspensions prepared from normal fowl tissue are not flocculated by such sera. The available evidence seems to justify the conclusion that tumour-agents exist in the form of elementary bodies similar to, but somewhat smaller than those which represent the causal agents of such typical virus diseases as vaccinia and fowl-pox.

Many attempts have been made to find filterable agents in mammalian tumours, but hitherto with so little success that it was thought such filterable agents were peculiar to fowl tumours. Recently, however, a warty papillomatous tumour of the skin, which is found in wild cotton-tail rabbits in America, has been described by Shope; this tumour can be transmitted by means of cell-free filtrates. Evidence has also been obtained that a filterable cell-free agent can be extracted from a mouse sarcoma, which agent after injection into other mice produces a tumour transmissible by grafts. If this work is confirmed, it would seem to prove that a cell-free agent may also be present in certain instances in mammalian tumours.

The mechanism of spontaneous recovery from implanted tumours has been studied by many workers during the past year. Some time ago it was reported that the serum of rats in which a Jensen's rat sarcoma was regressing contained substances (probably antibodies) which were toxic to cultures of J.R.S. cells. Dr. Phelps has repeated and extended these experiments. The sera of seventy rats in which a J.R.S. tumour had been implanted were examined daily for an appropriate period. From these carefully controlled experiments certain conclusions were drawn: When the tumour appeared to be growing vigorously, and the serum of the rat when applied to a twenty-four-hour J.R.S. tissue culture killed 5 per cent of the cells, then the tumour would invariably regress. Conversely, if the tumour is regressing then the serum of the rat always contains some of the toxic factor. The experiments indicate more clearly than any known facts that these toxic substances or antibodies are an essential part of the mechanism by which animals occasionally recover from an implanted tumour. When recovery has taken place, the rat is then firmly immune against subsequent implantations of the same tumour, and to some extent

resistant to other homologous tumours. The chemical and physical properties of these cancer antibodies indicate that they are similar to those produced in hyper-immunized animals. A peculiarity of the antibodies in these immunizing sera is that they do not appear to be specific to a single species. Thus a serum obtained from a rat is capable of causing regression of a mouse tumour.

Research on the action of short wireless waves has been carried out at the Cancer Research Institute, Newcastle-on-Tyne. Wave-lengths below fifteen metres are referred to as ultra-short waves (U.S.W.), and it is with this region that researches have been made. The penetration of animal tissues by U.S.W. leads to heating even of the deeper layers of the tissues, and it had to be decided how far the effect of the waves is due to heat and how much importance can be attributed to specific biological effects, i.e. effects independent of heat for which claims have been made. A special apparatus was devised by means of which it was possible to obtain a constant temperature; the contents of a glass vessel were kept at 38° C. over a period of two hours. *In vitro* experiments show that provided the temperature is adequately controlled even very large doses of U.S.W. have no *direct* action on the metabolism of the cancer cell. The effects claimed by Rester to have been produced by U.S.W. on Jensen's sarcoma must have been due to heat.

Experiments were made in which tumour tissue was exposed in the standard apparatus and afterwards transplanted into animals. Under these conditions exposure for one to two hours to 3·4 metres had no appreciable effect on the growth of the tumours in an extensive series of experiments. When the effects of heat are prevented, no so-called specific action has been shown by the ultra-short waves.

Experiments *in vivo* were made on tumours, and it was found that heating of the tissues could not be prevented, so it was not possible to separate thermal effects from the other effects of ultra-short waves.

Experiments on the therapeutic application of these short waves on tumours are still incomplete. The question of therapeutic dosage is receiving particular attention, and many experiments must be made to determine the minimum curative temperature (measured by thermo-needle) which must be attained in various tumours by different wave-lengths. This information should enable a decision to be made whether there is an optimum wave-length for the destruction of tumours as has been reported. Therapeutic experience up to the present, which covers a large number of treated animals, shows that by a more or less empirical treatment a system of dosage has been arrived at which in a single treatment has completely destroyed spontaneous and transplanted tumours in rats and mice.

Clinical and other Notes.

AN UNUSUAL CASE OF HYPOGLYCÆMIA.

BY CAPTAIN A. MACDONALD,

Royal Army Medical Corps.

THE patient, a Bavarian woman of 24 years of age, the wife of a British soldier, weighed 17 stone 8 ounces, but carried this remarkably well, being over 6 feet in height.

She reported first in March, 1935, suspecting pregnancy, and gave a history of having been delivered of a living female child by Cæsarean section at her last station (Calcutta) in November, 1934. Neither history nor physical examination disclosed any reason for this operation, and an inquiry made to the Registrar of the Civil hospital where the operation was performed was not answered.

The Zondek-Aschheim (A^1Z and A^1) test of the urine was found to be positive and she was taken on to the antenatal register and instructed to attend fortnightly.

The humid atmosphere of Rangoon caused the patient much physical distress and with the object of reducing her adipose state she was put on a course of thyro-ovarian gland extract and her diet modified. The patient's general condition improved, and by May, 1935, she had lost six pounds. After this, on account of the inclement monsoon weather conditions, she became slack in her routine attendances and had to be constantly reminded to attend.

In September, following an absence of five or six weeks, she was visited in quarters. She looked extremely ill and stated that she had not been feeling well for some weeks. Her symptoms were constant pounding headache, great weight in the limbs, lethargy, cardiac palpitation, disturbed sleep, frequency of micturition, and swelling of the legs. She complained also of great difficulty during the past fortnight in doing fine needlework.

Her face was grey and puffy, pulse thin and rapid, and jugular pulsation very marked, and there was deep pitting œdema of the legs (this at 8 a.m.). Field of vision tested by the moving finger appeared to be definitely restricted. Urine examination showed specific gravity 1026; acid reaction; albumin + + +. Foetal movements were active and foetal heart beat 136.

A diagnosis of pre-eclamptic toxæmia was made and arrangements were made for her admission to the Civil Obstetric Hospital, but as they could not take her until the following day she was put on a fluid diet and kept in bed.

The following day, to the great astonishment of all concerned, she walked into the Families Medical Inspection Room looking the picture of health and gave the following account :—

In March, when on the weight-reducing diet, her sugar consumption had been cut down and despite contrary advice later, in the interests of beauty, she had maintained a strict abstinence to date. During the previous night, however, she had been obsessed in her sleep by continuous vivid dreams in which she saw herself in confectioners' shops and patisseries, consuming creams and cakes of vast dimensions and incredible sweetness. On waking, the impression left by these dreams was so vivid that she forthwith went into Rangoon's best confectioner and ate her fill. The result was to her nothing short of miraculous, for almost at once she felt better and within two hours her symptoms had completely disappeared. On examination, two hours after the orgy, the urine showed a trace of sugar but no albumin.

In view of the previous Cæsarean history, it is interesting to note that this patient went normally to full term, and after a short normal labour a living male child weighing $13\frac{1}{2}$ pounds was born.

I am indebted to Lieutenant-Colonel A. G. Wells, D.S.O., R.A.M.C., Officer Commanding British Military Hospital (with Indian Wing), Mingaladon, for permission to send these notes for publication.

BATHING AND DRYING TENT APPARATUS.

BY COLONEL G. W. SUTTON, D.S.O.,

Officer Commanding 8th Battalion The Lancashire Fusiliers.

Administrative instructions issued at home and abroad for troops who are to be under canvas for a period always include a paragraph somewhat as follows:—

"The . . . Commander wishes all units to arrange hot baths for their men."

A search through the Regulations brings to light that a store tent and tubs, washing, are probably intended for this service, but without some organization and apparatus provided by the unit disorder would prevail during even the bathing of one platoon.

The problem was to create an efficient drying and bathing tent combined, within the means of the battalion, without greatly increasing the weight and bulk of the baggage carried to camp and in which the largest possible number of men could have a hot bath, or the drying of wet clothing could be carried out quickly under conditions where a little discipline would ensure that the battalion would obtain full value for the money expended.

It was agreed that the men should have screened compartments for bathing. String and canvas had been recommended but were found useless for various obvious reasons; supports made of wood were experimented with but found bulky, would probably deteriorate rapidly owing to transport and would be a dangerous structure in the case of a drying tent, therefore

a member of the battalion was asked to search round Manchester for some tubing which would be reasonably light and cheap.

The tubing was found and with a little bargaining here and there the apparatus was constructed and has been of great benefit to the battalion during the last two camps.

The apparatus was made in the form of a "Rack" composed of 1 inch galvanized tubing, intersected into 5 feet by 3 feet compartments by means of rails 3 feet and legs 5 feet 6 inches fastened firmly into the ground with a sealing plate and 4 inch spikes. The legs and outer arms are jointed together at the top corners by 1 inch elbows and the outer arms and centre rails by a 1 inch cross. It should be noted that the centre rail is made up of 3 feet rails.

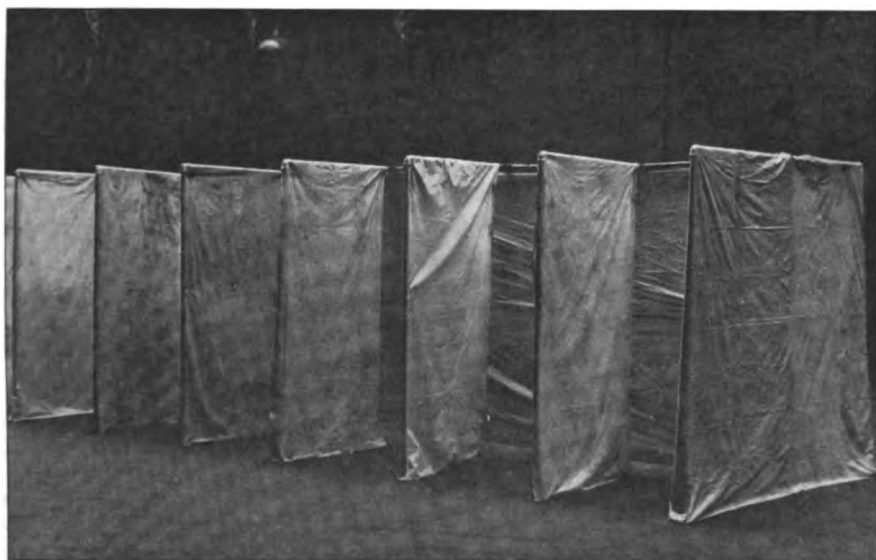


FIG. 1.

There is nothing to get out of order, no part need be numbered, and all parts are interchangeable. It is easy to assemble even on rough ground, it is strong, rigid, portable, there is no risk of fire, no tools are required and it may be erected by one man in thirty minutes.

If used in the open the number of compartments could be increased to any number, but in a store tent twenty-two compartments (i.e., eleven on each side) have been found the most suitable for a battalion of infantry; a smaller apparatus could be used for small units, i.e., companies R.A.M.C., R.A.S.C., or R.A.O.C., or even a company of an infantry battalion could be accommodated if on detachment.

The site chosen should be as near as possible to both the cookhouse for the supply of hot water and the ablution area for the use of the sump pit to carry away water after the men have finished bathing.

FOR BATHING (*see fig. 1*).

A length of canvas according to the length of the rack, 5 feet 6 inches in depth, is attached to the centre rail, and the compartments are completed by pieces of canvas, 3 feet by 5 feet 6 inches, attached to the arms; all the canvas is pegged down to the ground. Each cubicle should be provided with a 3½-gallon washing tub. This unit now recommends that the depth of the canvas should be 4 feet 6 inches.

All the Soyer stoves on charge to the cookhouse should be got ready immediately after dinner. The supply of hot water to the bathing tent, parties to bathe and the emptying of the washing tubs should be arranged by platoons under company arrangements. It takes about one hour for a company to have a hot bath.

**FIG. 2.****FOR DRYING CLOTHES** (*see fig. 2*).

Remove all the canvas from the rack, place it in the box (which should always be kept in the drying tent), light the braziers. Coke is suitable but care should be exercised and the braziers prepared away from the drying tent.

At least two men should be detailed to remain on duty as a guard to protect the clothing, canvas, etc.; in addition each company should detail one man to look after his company's clothing, equipment, etc.

The question of drying clothes is a great problem, especially if the men are caught in heavy rain some distance from camp. The ground sheet issued is very good and will protect the men from the knees upwards, therefore the only articles of clothing that may get wet are the trousers,

puttees, socks, and boots, and we have found that by means of our drying tent apparatus and a little organization the whole of the battalion were made reasonably comfortable in a couple of hours. In the case of great coats and blankets we make the Company Quartermaster-Serjeant of each company collect them and they are dried between the hours of 9 a.m. and 1 p.m.

Note.—This unit has always asked for the issue of two ground-sheets per man, and this is still considered an absolute necessity.

The photographs were taken in the drill hall, only the four inch spikes being removed. It will be noticed that no outside help, such as a wall, pillars, etc., is necessary for this apparatus.

The whole, i.e., arms, legs, canvas, etc., may be packed in a box 6 feet 3 inches by 12 inches by 12 inches. The apparatus, less canvas, cost this unit £5 10s. The apparatus described and illustrated was thought of and worked out by the Quartermaster of the unit, Lieutenant J. Christie, without any outside help by designers, etc.

CORONARY OCCLUSION IN A MAN AGED 27.

BY CAPTAIN L. R. S. MACFARLANE,
Royal Army Medical Corps.

RIFLEMAN M., of the Royal Ulster Rifles, was found dead in his bed at 7 a.m., on October 29, 1936, at Catterick Camp. No one had heard him cry out or appear to be in any distress during the night. He was an athletic, healthy man as far as his fellow soldiers knew.

At autopsy, six hours after death, the body appeared to be that of a healthy, well-nourished man. Post-mortem staining was beginning to appear in the cervical region, but rigor mortis had not yet developed.

On opening the chest, the heart was at once seen to be markedly hypertrophied and the right auricle almost completely infarcted. The hypertrophy was chiefly represented by the left ventricle, and to a lesser extent by the right ventricle.

Of the valves, the mitral and tricuspid were normal, but the pulmonary valve was thickened and had a few vegetations. The aortic valve was greatly thickened and vegetations were present. Ante-mortem clots were found in all chambers. A main branch of the coronary artery led direct to the infarcted area, which, as already stated, involved the greater portion of the right auricle. Ante-mortem clot was recovered from this vessel also.

Of the other organs, the liver was greatly congested, and the spleen to a lesser extent. The spleen was also notable in having two distinct lobes and rudimentary attempts at the formation of two more. The lungs were normal. Blood from the heart post-mortem gave negative Wassermann and Kahn reactions. The aorta was normal. There were no signs of specific disease anywhere.

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On scrutinizing the man's medical history sheet later, the following extracts which bore on the subject were noted :—

Tonsillitis, 1934. In hospital 111 days. Complicated by extrasystolic and presystolic murmur. Discharged for observation. 1935: Passed fit for service at home and abroad.

Points of interest are : Apparent lack of any symptoms until his hospital treatment in 1934. Apparent lack of physical signs, so that he was "passed fit" in 1935. The extreme rarity of coronary occlusion following rheumatic endocarditis. The extreme rarity of sudden death from coronary occlusion at his age. The unusual site of infection. The original finding of a presystolic murmur in a case of aortic stenosis.

Finally, since aortic stenosis is well known to be frequently missed owing to the vagueness of the symptoms, the interesting fact that when a definite symptom did appear it was a fatal one.

Echoes of the Past.

WAR EXPERIENCES OF A TERRITORIAL MEDICAL OFFICER.

BY MAJOR-GENERAL SIR RICHARD LUCE, K.C.M.G., C.B., M.B., F.R.C.S.

(Continued from p. 132.)

CHAPTER XX.—THE CAPTURE OF JERUSALEM.

PREPARATIONS proceeded busily for the next operation which was to involve the capture of Jerusalem itself. With the taking over of the right part of the line by the 20th Corps a readjustment of the troops was necessitated in order that the divisions might be in their proper positions to carry out the scheme of operation. This readjustment was made gradually as the divisions came up. The remaining brigades of the 74th were moved into the line ; when the 10th Division arrived on December 1 it at once replaced the 52nd which came out of the line and reverted to the 21st Corps. Two brigades of the Australian Division filled the gap between the 20th and 21st Corps. The headquarters of the 21st Corps moved at this time from Kubab to Ramleh. The positions of the divisions when the readjustment was complete were practically those shown on the map for the starting point of the operation.

The 31st and 32nd Field Ambulances rejoined their division as it came up from its position on the line of communications.

The 75th Casualty Clearing Station was opened at Junction Station on December 2, the 35th at Deir Sineid on the same day, with an advance dépôt of medical stores attached to it.

The A.D.M.S. Lines of Communication took over all responsibility for

evacuation from Junction Station southwards. The 53rd Division, still just north of Beersheba, came under the orders of 20th Corps again on December 2, but as regards supplies and evacuation of sick remained under G.H.Q. Its immobile section was still in the Turkish hospital at Beersheba. The 60th and 74th immobile sections were moved to Enab on December 3, and opened in the monastery and nunnery respectively. The 10th Division immobile sections opened at Latrun with all available tents near the junction of the roads to act as a relay post on the road from Enab to Junction Station and also from the 10th Division Field Ambulances.

The distribution of the sanitary sections was as follows :—

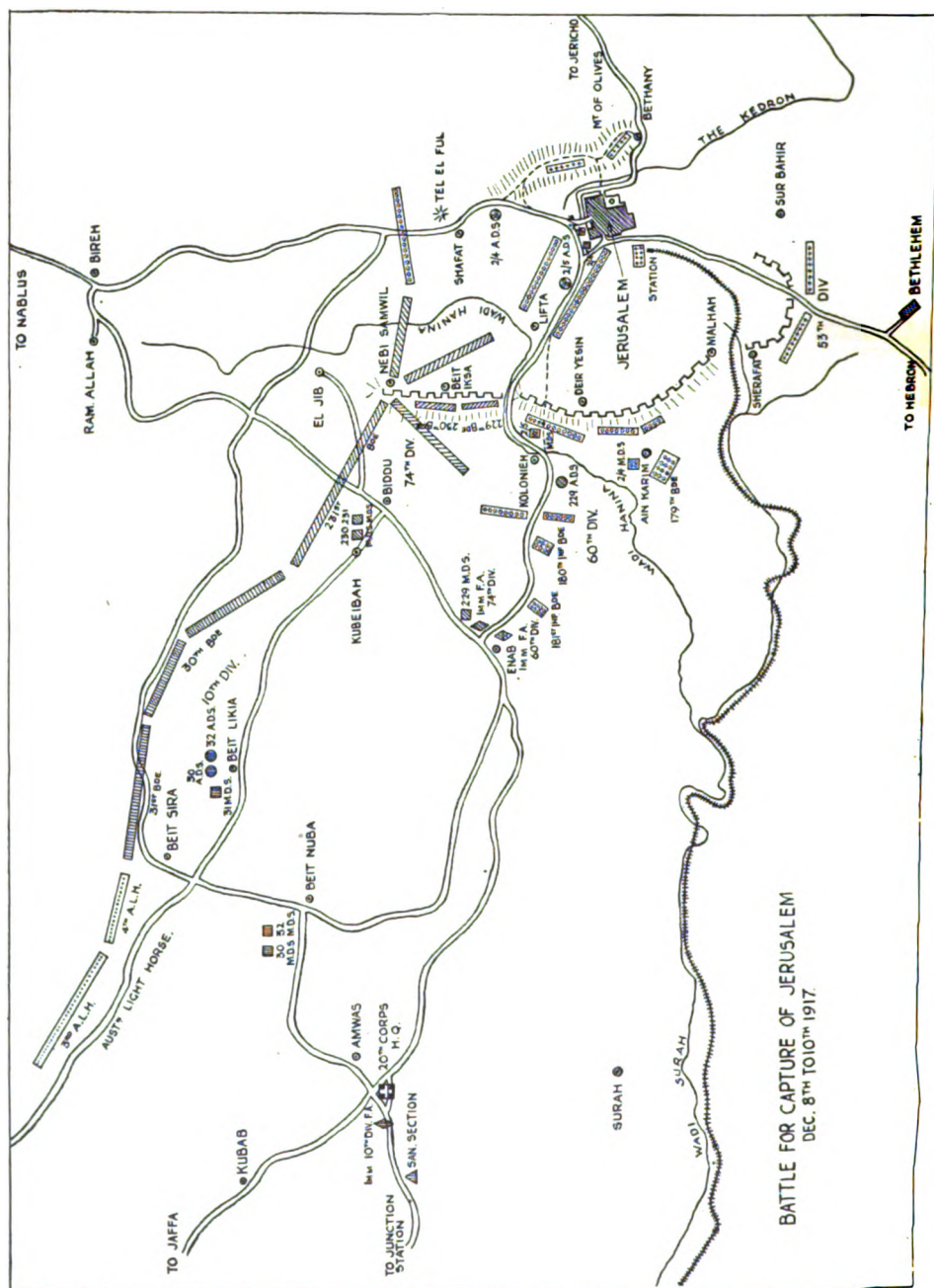
87th, belonging to the 74th Division at Latrun; 60th at Beersheba; 18th at Belah; 53rd on its way from Belah to Latrun.

The motor ambulances of the 10th, 60th and 74th Divisions had now been all reassembled under Corps control and placed under command of an R.A.M.C. officer detailed from the 10th Division. They were stationed at Junction Station, but six Ford ambulances were attached to each division. Sixteen additional Ford cars belonging to the Motor Ambulance Convoy were attached to the Corps from G.H.Q. on December 5.

It has been shown that the attempt to carry Jerusalem in a rush without dealing with the city itself had failed. It had been found impossible for the exhausted divisions of the 21st Corps and Desert Corps to reach the Nablus Road, North of Jerusalem, owing to the strong opposition met with at Nebi Samwil. It has also been shown how the 20th Corps was brought up to take over the right half of the line and put into position to carry out a definite operation for the capture of Jerusalem.

Jerusalem, before the War, had a population of 80,000. It consists of two parts, the old city—entirely surrounded by walls—and a modern suburb on the north-west of the walled city. The city lies just below the crest and on the eastern side of the backbone or water-parting of Palestine. It has an altitude of 2,500 feet above the Mediterranean, and nearly 4,000 feet above the Dead Sea. Jerusalem is approached by only four main roads, roughly from the four main points of the compass; the Nablus Road on the North, the Jaffa on the West, the Hebron on the South, and the Jericho on the East. There was also a metre gauge railway to it from Jaffa, constructed about thirty years earlier. This had, however, been entirely put out of action by the Turks by the destruction of several bridges and they had at the same time removed or destroyed all the rolling stock except that captured at Junction Station and referred to before. The railway approaches the city from the south-west.

The town had no regular defences before the War. During the summer of 1917 the Turks had prepared a fairly complete system of trenched defences about four thousand yards from the city on the western side and a series of trenches of a slighter nature across the Hebron Road, about six miles from the town just south of Bethlehem. Nowhere were the defences deep, and rarely consisted of more than a single line of trenches with



communication trenches leading back from them to the crest of the hill. In some parts where the ground was very hard and steep, walls took the place of trenches. The western defences were on the forward slope of the backbone ridge and extended from just west of the village of Malha northwards right across the Jaffa Road to Nebi Samwil. This is a distance of about ten thousand yards as the crow flies, but owing to the windings of the hill contour, it was much longer as regards length of front. On the east side of the town, and separated from it by the deep valley of the Kedron, is the Mount of Olives, a hill almost as high as that on the west side of Jerusalem. It looks down on the city on the one side and on the Jordan and Dead Sea, about fifteen miles away, on the other.

The approach is steep almost everywhere. The line of hills forming the entrenched position on the west is broken only at the point where the Wadi Hannina passes through. This wadi, starting some eight miles north of Jerusalem, runs close to the Nablus Road as far as Lifteh and then turning west, passes through the line of trenches about half a mile further west. The Jaffa-Jerusalem Road runs up the wadi, mounting gradually on the southern side until at Lifteh it leaves the valley and crosses over the crest into the north-west suburbs of the town.

Opposite the village of Ain Karim, two miles further south, there is a spur running out from the main position in a south-easterly direction and separated from it only by a small depression. If this spur were in the hands of an attacking force, it would give a comparatively easy approach to the main position. Very little was known definitely about the Turks available for the defence of Jerusalem. The estimate given on December 3 was that on the Hebron Road, there were between five and twelve hundred, and from the right of the 60th Division to the left of the 10th Division at Suffa, a maximum of fifteen thousand. To oppose these there were the four divisions of the 20th Corps.

The scheme for the operation was as follows :—

Nebi Samwil was to serve as a pivot. The existing line from Nebi Samwil to Suffa was to be held by one brigade of the 74th Division on the right and the three brigades of the 10th on the left. Two brigades of dismounted Australian Light Horse prolonged the left flank and connected up with the 21st Corps. The two remaining brigades of the 74th and the whole of the 60th Division were to attack the western defences of Jerusalem, from Ain Karim on the south, to Nebi Samwil on the north. Two brigades of the 53rd Division, marching up from Beersheba, by the Hebron Road, were to make a simultaneous attack from the south. The remaining brigade of the 53rd was left at Beersheba, chiefly owing to lack of transport. The dividing line between the 60th and 74th Divisions was the Jaffa-Jerusalem road as far as Lifteh and beyond that the Wadi Hannina.

The attack was to take place at dawn on December 8, and the 53rd Division was to reach Sherifat, south of Jerusalem, by the morning of that day, so as to co-operate in the attack.

The western attack was divided into four stages.

In the first stage the 60th Division was to capture the enemy works between Malha and the Jaffa-Jerusalem road, and the 74th the enemy's works between that road and Nebi Samwil, which covered the village of Beit Ikhsa. The advance of the 74th Division was to be timed by that of the 60th.

In the second stage the 60th, swinging leftwards, would advance across the plateau behind the defences to the line of the road between Jerusalem and Lifteh.

In the third stage the 60th would advance as far as the line of the track running from the Nablus road to Beit Ikhsa from the commencement of the track to where it crosses the Wadi Hannina. The 74th would at the same time advance to take possession of the spur of hill running south-east from Nebi Samwil.

In the fourth stage the 60th would advance astride of the Nablus road as far as Shafat and push forward to secure the high ground on the east of the road, including Tel el Ful, a prominent conical hill just east of the road. The rôle of the 53rd Division was to cover the right flank of the 60th Division, advancing with it as soon as touch was obtained and then moving in two parties north and south respectively of the city to take up positions on the east of the town, which would protect the 20th Corps' right flank from attack from the east.

The Corps cavalry regiment, the Westminster Dragoons, was attached to the 53rd Division, and was detailed to patrol the Jerusalem-Jericho road as soon as it was reached.

Before the attack began, owing to the absence of cross-country roads, it was exceedingly difficult to maintain communication with the 53rd Division. It had to be done largely by aeroplane.

For the first stage of the operation the 60th Division was employing two brigades, the 179th and the 180th, the 181st being in reserve. The 179th was instructed to seize the high ground to the south of Ain Karim overnight and make an attack at dawn along the ridge which, as described above, runs out as a spur from the main position. The 180th was to divide its attack between the Jaffa road and a wadi immediately to the south of Deir Yesin, which was the main gun position and lies just behind the highest point of the crest. It was strictly enjoined upon all ranks that under no circumstances was the walled city of Jerusalem to be entered or shelled.

The medical arrangements were as follows :—

The nearest casualty clearing station was at Junction Station, more than twenty-five miles from Jerusalem. Owing to transport difficulties and the state of the roads, it was impossible to get one up nearer. The Turkish railway was usable between Junction Station and Deir Sineid for evacuation, when it was not washed away. The 35th Casualty Clearing Station was at Deir Sineid, with a siding on the broad gauge railway which

had now been brought in to this point from Deir el Belah. The Jaffa-Jerusalem railway was completely out of action owing to destruction of bridges. The immobile section of the 10th Division was at Latrun, equipped with tents and prepared to take in two hundred and fifty cases. The immobile sections of the 60th and 74th Divisions were in a monastery and a disused nunnery respectively at Enab, and could house at a pinch seven or eight hundred cases. The route of evacuation from Kubeibah across the mountains to Enab was exceedingly bad and only fit for camel or hand transport.

The 53rd Immobile Section remained at Beersheba, prepared to take casualties evacuated by the 53rd Division until they were within reach of Jerusalem.

The distribution of motor ambulances was as follows :—

Six were placed at the disposal of the A.D.M.S. 10th Division for evacuation on the Beit Sira and Beit Likia routes to Latrun.

The 53rd Division had the whole of their cars and ten additional Fords from G.H.Q., and with these were responsible for evacuation of their casualties right through Hebron and Beersheba to Imara.

All the remaining motor ambulances of the Corps were parked at Enab, one quarter at the disposal of the A.D.M.S. 60th to work forward from the dressing station and the remainder under the D.D.M.S. to evacuate from Enab to Junction Station.

Routes of evacuation for the divisions was as follows :—

In the initial stages :—

60th Division to the Enab-Jerusalem road and thence to Enab.

74th Division via Biddu and Kubeibah to Enab.

10th Division—Right flank to Kubeibah and thence to Enab.

Left flank to Beit Likia or Beit Sira and thence to Latrun.

In the later stages :—

The 60th Division was to establish dressing stations in suitable buildings in the north-west suburb (European Quarter) of Jerusalem and the 60th, 74th, and 53rd Divisions were then to be evacuated through these to Enab. Sand carts were to be used on the Enab-Jerusalem and Jerusalem-Nablus roads and possibly between Kubeibah and Enab, if a new road which was being made could be got ready in time. Elsewhere camel cacolets and carriage by hand would have to be used. One hundred Egyptian Labour Corps men were distributed among the divisions to assist in the carriage of wounded by hand, with instructions that they were not to be used in the front line during action. Preparations were made on the basis of a possible three thousand casualties occurring during the operation.

The 18th Sanitary Section was held in readiness to move forward into Jerusalem as soon as possible after its capture.

During the operation I remained at Latrun while my D.A.D.M.S., Major Lelean, took up his station at Enab to superintend the evacuation from that place.

The weather on December 7 was very wet and the Enab road became almost impassable for cars.

The attack took place as arranged at dawn on the 8th, and news was received by 8.30 a.m. that the first objective had been gained with comparatively small casualties. Unfortunately the 53rd Division, owing to the bad weather, had been unable to reach the position on the Hebron Road between Sur Bahir and Sherafat from which it was to co-operate with the 60th Division in the further advance. It was therefore decided to hold up the advance until it arrived. This did not take place until late on the night of the 8th so that the resumption of the attack was fixed for the dawn of the 9th.

During the interval the Turks were busy withdrawing from the town to the north and east.

The order by the Turkish commandant to the Mayor to surrender the town was signed in the study of the residence of the English Bishop of Jerusalem at 3 p.m. on December 8, and at 9 a.m. on the 9th the Mayor came out and handed over the keys to one of the brigadiers of the 60th Division.

During the 9th the 60th and 74th Divisions pushed on according to plan and by nightfall had gained their final objectives and were holding the line just north of Shafat. It was found that the Turks had only retired a mile or two down the Jericho road so that it was impossible for the Corps cavalry to proceed far along that road.

The 53rd Division took up a position on the Mount of Olives and on the Jericho road near Bethany so as to cover Jerusalem from the east.

The medical arrangements worked according to plan. The 2/4th Field Ambulance had an advanced dressing station in a monastery at Ain Karim to which casualties were brought from the right brigade of the 60th Division. The 2/5th had one in a house at Kolonieh where the Jerusalem road crosses the Wadi Hannina. The wounded had to be brought down to the advanced dressing stations almost entirely by hand carriage. Those from the 2/4th were evacuated through the 2/5th and taken thence to Enab in sand carts.

The 221st Field Ambulance of the 74th Division also had a dressing station at Kolonieh, but practically the whole of the casualties of this division were taken to Kubeibah.

As soon as Jerusalem was occupied the 2/5th Field Ambulance took over a portion of the Jewish hospital on the Enab road near the outskirts of the new town, and soon afterwards the 2/4th and 2/6th moved into permanent buildings in the Russian enclosure which were well adapted for temporary hospitals and which had been used as such by the Turks.

The 2/4th sent on an advanced dressing station to the beginning of the Nablus road just outside Jerusalem on the north side.

The numbers of wounded in this operation were surprisingly small. The 60th had evacuated three hundred and thirty-seven and the 74th

one hundred and ninety-nine, to Junction Station by December 13. This did not include a few retained in Jerusalem as being too ill to move. The 53rd Division had practically no casualties and the 10th, which was holding the line, was not attacked and only had ten wounded during the period. The total wounded, therefore, was under six hundred. During the same period, i.e. from the 9th to 13th inclusive, eight hundred and fifty-one were evacuated sick from the Corps.

In the Turkish hospitals in Jerusalem we found about six hundred sick and wounded Turks. There was little or no infectious disease among them, but they were suffering badly from want of food and dressings. A special convoy of twenty Ford motor vans containing these necessities was sent up immediately by G.H.Q. to relieve the situation, and the sick and wounded prisoners were evacuated as quickly as possible.

On the 10th I went up to Jerusalem to inspect the arrangements for evacuation, and along the whole route found everything working satisfactorily.

The 10th Division immobile section at Latrun was not overcrowded. Those of the 60th and 74th at Enab were practically clear, and the field ambulances of the 74th at Kubeibah were reported the same.

At Kolonieh the dressing stations of the 2/5th London and the 229th Field Ambulances were clear. The former was moving forward to Jerusalem and the latter rejoining the rest of the unit at Enab.

At Jerusalem the 2/4th and 2/6th London Field Ambulances were occupying the buildings in the Russian enclosure. Two buildings, the palace of the Archimandrite and the adjoining pilgrim hospice were being used for British patients and a third building for Turkish prisoners. The French hospital of St. Louis, under the charge of some local nursing sisters, contained a few wounded Yeomanry belonging to the Corps cavalry under their own medical officer.

Cook's hotel, just inside the city gates, which had been used by the Turks as a hospital and managed by some American Red Cross ladies, contained a few British wounded prisoners, left behind by the Turks, and 158 Turks, mostly serious cases.

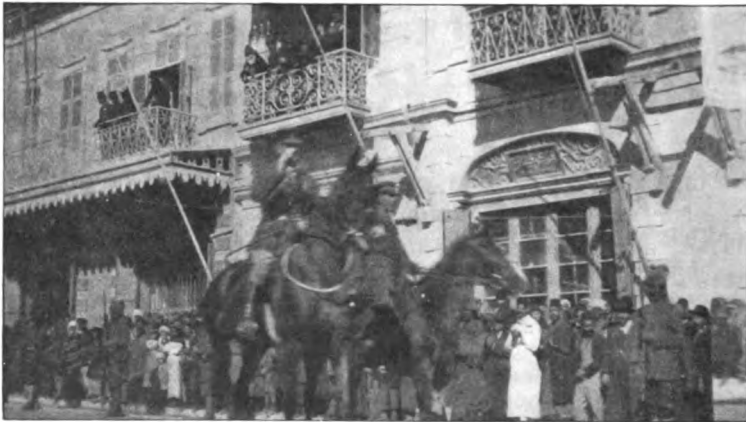
Arrangements were made for the clearing of this hospital as soon as possible. Turkish wounded, if too bad to move, were transferred to the Russian building. Arrangements were also made for the 53rd Division to open a field ambulance in the small, well-appointed Rothschild Hospital. The German Deaconess Hospital, which is an exceedingly well-appointed, up-to-date hospital, was visited, but was left free for the use of the civil population under instructions from the D.M.S.

The English Hospital, which before the War was a modern, well-equipped hospital under the charge of Dr. Masterman, of the London Mission to Jews, had been dismantled by the Turks, and used as their Corps Headquarters. This was now taken over by the 60th Divisional Headquarters.

Jerusalem, owing to the need at certain times of the year for accommodating large numbers of pilgrims of all classes, contains a considerable number of hospices constructed by the charitable of all nations and sects for this purpose. These are, for the most part, large and well adapted for the temporary accommodation of casualties. They proved most useful in the ensuing weeks when continuous bad weather interfered with evacuation down the line, and enabled us to accommodate a large number of sick and wounded in comparative comfort.

This visit to Jerusalem on the day following its first occupation by Christian troops after seven hundred and eighty years was a memorable and thrilling experience.

The Jaffa road winds slowly up the hill which shuts out all view of the city until the crest is reached. Recurrent disappointment at the numerous



Sir Edmund Allenby about to enter Jerusalem.

bends only adds to the excitement of the final moment when the town bursts into view. One could not help having something of a Crusader's feelings. Of course, Jerusalem was not the ultimate goal for which we were fighting, as it had been that of the first Crusaders; but we should not have been human, I think, had we not felt that in a measure we were the successors of those old ancestors of ours who came so far and went through so much for their religion's sake. Jerusalem still stands for something to the Christian world. At the least it is the point of issue of the greatest influence the world has ever known, and to most of us infinitely more than that.

To add to one's own feelings of excitement there was the evident joy and enthusiasm betokened in the faces of the inhabitants. They thronged the streets to welcome us as deliverers from a hated rule.

Jerusalem is not a Turkish town. Two-thirds of the population are Jews, and a considerable proportion of the remainder Christians, and of the Mohammedans only a small part are Turkish sympathizers. There is a

considerable element which has German leanings, but these were doubtless in the background on that day.

There was no time on this occasion to explore the city but the little one saw whetted the appetite for more.

The state entry of the Commander-in-Chief, Sir Edmund Allenby, into the walled city took place next day, December 11. The entry was made on foot through the Jaffa gate. He was accompanied only by a small staff and an escort containing representatives of the troops of England, France and Italy. He proceeded to the old Turkish barracks where the proclamation was read. No triumph and no display.

Thus ended another phase of the Palestine expedition.

(To be continued.)

Current Literature.

COOK, S. S. **The Incidence of Cerebrospinal Fever in the United States Navy as related to Length of Service and Season of Enlistment.** *Amer. J. Hyg.* 1936, v. 23, 472-85, 2 figs.

In this very careful investigation two periods in which conditions were very different were selected for study. The first comprises the war years 1917 and 1918 when recruits were assembled hurriedly into overcrowded barracks, hastily equipped and trained, and transferred to active and strenuous duties aboard ship and elsewhere. For comparison with these years the five-year period 1926 to 1930 was chosen, during which recruiting, equipping and training proceeded in an unhurried, deliberate manner. During 1917-18 the incidence of cerebrospinal fever in the Navy was very high; from 1926 to 1930 it was above the usual average, but there was no sharp widespread epidemic as in 1917-18. In each year the highest incidence falls within the first two months of service, the maximum being more often in the second than in the first month. If the first two months of service be grouped together the attack rate diminishes regularly and rapidly with increasing length of service. It is of interest that during 1917-18, when the incidence in the Navy as a whole was at a maximum (two to three times the rate in 1926 to 1930), and when training stations were most crowded, the attack rates in recruits during their first three months of service were not higher than was usual in 1926 to 1930. The fatality rate was no greater in men recently enlisted than in those with longer service, so that the recruit's greater risk of attack is not associated apparently with greater severity of the disease.

In 1926 to 1930 attack rates per 100,000 in men of more than two months' service were 21.4 at training stations and 2.4 elsewhere. The difference cannot be attributed wholly to a less favourable environment at

the former for the personnel of more than two month's service present at the training stations comprises more short-period men (of two to twelve months' service) than the rest of the Navy, and these have relatively high attack rates. But the training stations contributed 9·8 per cent (six out of sixty-one) of all the cases which occurred in 1926 to 1930 in the whole Navy in men of more than twelve months' service, while the proportion of men of this class who are on duty at training stations is something less—probably considerably less—than 5·8 per cent of the total of their class in the whole Navy. It thus seems that seasoned men associated with recruits in training camps suffer higher attack rates than men of similar length of service elsewhere.

In 1926 to 1929 men who enlisted in the months of October to February experienced an attack rate during their first year of service of 35·5 per 100,000 as compared with a rate of 16·3 for those who enlisted in March to September. This observation suggests the possibility of a reduction in morbidity from cerebrospinal fever by the adoption of seasonal recruiting—which might apply also to concentration of men for other purposes.

A. BRADFORD HILL.

Reprinted from "Bulletin of Hygiene," Vol. 12, No. 1.

HARMON, P. H., & HARKINS, H. N. **The Significance of Neutralizing Substances in Resistance and Recovery from Poliomyelitis.** *J. Amer. M. Ass.* 1936, v. 107, 552-8. [58 refs.]

Recently the efforts made to prevent poliomyelitis by vaccination were forced to an abrupt halt by the suspicion that a few cases of the disease resulted from the method. Endeavours are now being made to find a safer method of prevention and the question is raised whether the neutralizing substances are an accurate expression of immunity in this disease. It has been found that a large number of convalescents are devoid of neutralizing substances; thus of 183 human convalescents examined 39·8 per cent were without antibody; but on the other hand, a large percentage of adults drawn at random from the general population and who have had no obvious exposure to the disease carry neutralizing substances in their blood. A peculiarity of the poliomyelitis virus is its weak antigenicity. Skin tests for susceptibility have been negative in the hands of most workers. The artificial introduction of virus either into or beneath the skin develops neutralizing substances more or less regularly and the response exceeds that produced by an attack of experimental disease. The authors' experiments indicate that neutralizing substances are present in the blood-stream ten days after a single injection. A source of antipoliomyelitis neutralizing substances might be human placental extracts.

Traumatic influences or lowered resistance may allow the virus to ascend from the nasopharynx into the central nervous system. Tonsillectomy and extreme muscular exertion have been reported as precipitating an attack of poliomyelitis with the characteristic incubation period. Treat-

ment of the nasopharynx by alum, tannic acid, trinitrophenol or mercurochrome has been effective in preventing the passage of the virus.

That convalescent or other serum modifies the natural course of human poliomyelitis has yet to be conclusively proved. There is the difficulty in evaluating the many observations that the severity and types of the acute disease vary in different epidemics and even in the same epidemic. Statistical analysis of certain large epidemics has failed to elicit favour for human convalescent serum except that the earlier the serum is used in the acute stage the less is the incidence of either acute or residual paralysis. In view of this symptomatic improvement it is recommended that convalescent serum treatment and specific serum therapy should be continued.

A. J. COLLIS.

Reprinted from "*Bulletin of Hygiene*," Vol. 12, No. 1.

BECK, A. Investigations on the Problem of Immunity against *Spirochaeta pallida* in General Paralytics Treated with Malaria. *J. Mental Sci.* 1936, v. 82, 254-62. [29 refs.]

The effect of malaria on G.P.I. is attributed by many workers solely to the heat. Others do not find this explanation sufficient as, for example, it does not account for cases which improved though the temperatures attained were well below the lethal point for *Sp. pallida*, or for those apparently cured of G.P.I. in which later events showed that specific spirochaetes in other parts of the body had not been killed. Various workers have suggested that the fever increases the anti-spirochaetal bodies, and some claim to have demonstrated such antibodies in the blood and cerebrospinal fluid of malaria-treated general paretics. Beck was unable to confirm these claims. Serum and cerebrospinal fluid of paretics who had improved after malarial treatment had no more effect *in vitro* on the motility of *Sp. pallida* (from rabbit lesions) than had similar fluids from non-syphilitic persons. As to spirochaeticidins, the serum of seven treated paretics, of one untreated parietic, and of two non-syphilitics respectively had equally no effect on the virulence of emulsion of rabbit chancre when mixed with this for two hours in the proportion of twenty serum to one emulsion. Similarly, admixture of serum and cerebrospinal fluid respectively from two treated paretics and one non-syphilitic with leucocyte emulsion and chancre emulsion did not affect the latter's infectivity. The author thinks that as the heat and humoral antibody factors can probably be excluded as explanations of the therapeutic effect of fever in general paresis, the destruction and disappearance of *Sp. pallida* from the brains in these cases must be due to the activity of the cells. He admits, however, that his search for antibodies was carried out only by rough methods. For an exact examination a quantitative titration of the hypothetical antibody with varying doses of spirochaetes would have been necessary. This was not done because it would have involved too great a consumption of animals.

L. W. HARRISON.

Reprinted from "*Bulletin of Hygiene*," Vol. 12, No. 1.

HORSFALL, F. L., Jr., & GOODNER, K. Lipids and Immunological Reactions. II. Further Experiments on the Relation of Lipids to the Type-Specific Reactions of Anti-pneumococcus Sera. *J. Immunology*. 1936, v. 31, 135-40.

In a previous paper [*Bulletin of Hygiene*, 1936, v. 11, 151] the author showed that the presence of certain lipoids is essential for the demonstration of specific precipitation, or agglutination, with Type I antipneumococcal sera. The extraction of all lipoids from antisera prepared in the horse entirely eliminated their precipitating and agglutinating power, while rabbit antisera similarly treated showed a marked, but incomplete, loss of these properties. It was found that the addition of lecithin restored the agglutinating and precipitating power of extracted horse antisera and the addition of cephalin that of extracted rabbit antisera.

Although the extracted sera gave no agglutination or precipitation, the mouse protective properties remained unaltered. Moreover, it was shown that a great part of the antibody remaining in an extracted antiserum could be absorbed by treatment with Type I pneumococci, although no agglutination occurred. This suggested that the lipoids are concerned in the second phase of an agglutination or precipitation reaction, but do not affect the capacity of the antibody to unite with antigen. In the present paper the authors report further experiments in support of this hypothesis. They find that Type I pneumococci, after treatment with an extracted horse antiserum, failed to agglutinate in the presence of an unextracted antiserum, indicating that the lipoid free antibody has combined with, and hence blocked, the specific antigenic sites on the pneumococcal capsules.

They also discuss the curious specificity of cephalin and lecithin in restoring activity to rabbit and horse antisera after extraction. They find that certain animal species—guinea-pig, rat and sheep—behave like the rabbit in that the activity of extracted sera is restored by cephalin, while other species—man, mouse, cat, dog and goat—behave like the horse, in that the activity of extracted sera is restored by lecithin. They note also certain other peculiarities in immunological behaviour which characterize, and differentiate, these two animal groups.

W. W. C. TOPLEY.

Reprinted from "Bulletin of Hygiene," Vol. 12, No. 1.

HORSFALL, F. L., Jr., & GOODNER, K. Lipids and Immunological Reactions. III. Lipid Content of Specific Precipitates from Type I Antipneumococcus Sera. *J. Exper. Med.* 1936, v. 64, 583-99, 5 figs. [11 refs.]

The authors have reported, in previous papers, that the presence of certain lipoids is essential for the *in vitro* demonstration of type specific agglutination and precipitation by antipneumococcal sera. It was

suggested that the antibody concerned might be a phosphatideglobulin complex.

In the series of experiments recorded in the present paper, the precipitates resulting from the interaction of Type I pneumococcal polysaccharide and Type I antisera, prepared in the horse or rabbit, have been analyzed, by appropriate micro-methods, for total nitrogen, lipoid nitrogen and lipoid carbon. It was found that lipoid material may, under certain conditions, form as much as 51 per cent, or as little as 4 per cent, of the total precipitate. The total lipoid content of the precipitate was, moreover, found to be entirely independent of the total protein content. The lipoid content appeared to be a function of the initial total concentration of lipoid in the reacting system; and the quantitative data were in accord with the view that the removal of the lipoid by the precipitate was an absorption process. These observations clearly indicate that the greater part of the lipoid found in such precipitates is not associated in any way with the antibody protein; but they do not, as the authors point out, exclude the possibility that a fraction of the total lipoid is present in the antibody as such, while the remainder is non-specifically absorbed.

W. W. C. TOPLEY.

Reprinted from "Bulletin of Hygiene," Vol. 12, No. 1.

BRIGHTMAN, I. J.; TRASK, J. D. **Recovery of a Filtrable Virus from Children with Influenza.** I. **Epidemiologic and Clinical Observations** [BRIGHTMAN & TRASK]. *Amer. J. Dis. Children.* 1936, v. 52, 67-77, 4 charts. II. **The Experimental Disease in Ferrets** [BRIGHTMAN]. *Ibid.* 78-91, 5 figs. [13 refs.]

In the first of these papers, the authors describe the isolation of a filtrable virus, producing the characteristic reaction in ferrets, from children suffering from influenza in New Haven, U.S.A., during the winter of 1934-35. The first successful isolations were made from three cases occurring during an epidemic of influenza in a boys' school. In each case ferrets reacted typically to the intranasal instillation of nasopharyngeal washings. At later dates four other strains of virus were obtained from infants, all under one year, who were admitted to the New Haven Hospital suffering from infections clinically diagnosed as influenza, and occurring during an epidemic of the disease.

In the second paper, Brightman describes in some detail the course of the disease in ferrets. He records its successful transference from ferret to ferret in serial passage, and notes the immunity of recovered ferrets to reinfection. Cross-immunity with recovered ferrets, and protection tests with immune sera from recovered ferrets or human subjects, demonstrated the immunological identity of the five strains of virus with which the author was working. Three tests were made with one of these virus strains and serum from ferrets recovered from infection with the Porto Rico strain of influenza virus isolated by Francis, and two tests with the

same virus and serum from ferrets immune to Francis's Philadelphia strain [*Bulletin of Hygiene*, 1935, v. 10, 538]. The result indicated the probable immunological identity of the New Haven, Porto Rico and Philadelphia strains, though one test must be regarded as doubtful on account of the mildness of the infection in the controls. It is also noted that Francis has examined the sera of ferrets recovered from infection with this New Haven strain, and has found that it neutralizes his Porto Rico and Philadelphia strains of virus, so that the New Haven strains may justifiably be added to the growing list of strains from various parts of the world that have been shown to be immunologically identical with each other, and with the original strain of influenza virus isolated in the classical studies of Laidlaw, Smith and Andrews [*Bulletin of Hygiene*, 1933, v. 8, 697].
W. W. C. TOPLEY.

Reprinted from "Bulletin of Hygiene," Vol. 12, No. 1.

SMITH, W., & STUART-HARRIS, C. H. **Influenza Infection of Man from the Ferret.** *Lancet*. 1936, July 18, 121-3, 1 chart.

On March 8, 1936, one of the authors (S.-H.) examined six ferrets that had been infected, three days previously, with a strain of human influenza virus. This strain had been transmitted through one hundred and ninety-six ferrets since its isolation from a human case of influenza, and during these passages it had acquired the property of producing lung lesions in ferrets, and had become virulent for mice, characters that have not been found in strains of virus freshly isolated from man. The six infected ferrets were at the height of the disease, with nasal discharge, watery eyes and sneezing.

It was noted at the time that one ferret sneezed violently, at close range, while being examined. Forty-eight hours later S.-H. went down with a typical attack of influenza, his temperature reaching 102° F. on the third day. Throat and nose washings were obtained on the first, third and fifth day of illness. Those obtained on the first and third day produced typical influenza in the ferret; moreover, they shared with the passage-strain of virus the ability to produce lung lesions in the ferret, and they were infective for mice. Samples of the patient's serum obtained a few months before his illness were fortunately available, and further samples were taken on the third, eighth, sixteenth, thirty-first, forty-fourth and eighty-first day after the onset of symptoms. The results obtained in the titration of these samples by mouse protection tests showed that S.-H. had no demonstrable neutralizing antibodies to the human strain of virus prior to infection, while following infection there was a steady rise in antibody titre, reaching a peak between the sixteenth and thirty-first day, and thereafter slowly declining. Antibodies were still demonstrable to relatively high titre on the eighty-first day. It is noted that S.-H. had, in his serum, a moderate titre of neutralizing antibody for the virus of swine influenza prior to infection, and this titre increased after the onset of

symptoms. These findings are in accord with the previous observation, by several workers, that the viruses of human and swine influenza, though possessing an antigenic factor in common, are immunologically distinct.

The possibility is discussed, in some detail, of S.-H. having contracted influenza from some other source, and adequate reasons are given for believing that it was unlikely that he had been exposed, at the time in question, to other risks in infection. The actual sequence of events, combined with the distinctive characters of the virus recovered, makes it almost certain that the disease was derived from the ferrets infected with the strain that had been passed through almost two hundred of these animals.

W. W. C. TOPLEY.

Reprinted from "Bulletin of Hygiene," Vol. 12, No. 1.

LEVADITI, C., PAIC, M., & KRASSNOFF, D. L'ultrafiltrabilité et les dimensions probables du virus vaccinal (orchivaccin et neurovaccin). [Ultrafiltrability and the Probable Dimensions of Vaccinial Virus (Orchivaccine and Neurovaccine).] *C. R. Soc. Biol.* 1936, v. 122, 526-9, 1 fig. [10 refs.]

The authors used two strains of testicular virus and one of neuro-virus as well as two extracts of testicular virus purified by adsorption on kaolin, one the first elution and one the fourth. The initial virulence of the purified extracts was much lower than that of the original virus and the limit of the size of the pores in the collodion membrane through which these extracts failed to pass was appreciably larger. These findings are in accord with those of Elford and Andrews [*Bulletin of Hygiene*, 1932, v. 7, 593] and this is probably due to adsorption of the virus particles by the collodion. There was no significant difference in this respect between the testicular and the neuro-virus. The smallest size of pore through which any virus passed indicated, after applying Elford's correction formula for the relation of the size of a particle to the size of a pore that will just retain it, that the probable size of the vaccinia virus particles lies between 0.14μ and 0.16μ . This is in accord with the findings of Elford and Andrewes.

O. K. WRIGHT.

Reprinted from "Bulletin of Hygiene," Vol. 12, No. 1.

PULLINGER, E. J. The Influence of Tuberculosis upon the Development of *Brucella abortus* Infection. *J. Hygiene.* 1936, v. 36, 456-66. [11 refs.]

The difficulty of isolating *Br. abortus* from samples of dirty milk containing tubercle bacilli suggested that tuberculous infection in the guinea-pig might prove inimical to the development of *Br. abortus*. To test this, one group of guinea-pigs was inoculated with a mixture of tubercle and *abortus* bacilli, suspended either in saline or milk, while a control group was inoculated with *abortus* alone. A number of experiments of this type were performed. The results were striking, and

indicated that tuberculosis interfered with the establishment of a strain of *Br. abortus* of low virulence, and to some extent with that of a strain of high virulence. Thus, of 26 guinea-pigs inoculated with a mixture of virulent tubercle bacilli and *abortus* bacilli of low virulence, only one developed Brucella infection, while of 30 non-tuberculous controls all were found to be infected with *Br. abortus*. Of 26 guinea-pigs inoculated with virulent tubercle and virulent *abortus* bacilli, 5 developed Brucella infection, while 25 out of 27 non-tuberculous controls became infected. That the results were not due to a direct destruction of *Br. abortus* by tubercle bacilli was shown by the fact that the development of *Br. abortus* in the guinea-pigs was inhibited even when suspensions of the two organisms were inoculated separately into opposite sides. The conclusion is that the mononuclear cell reaction stimulated by the tubercle bacilli was responsible for the destruction of *abortus* bacilli in the animal body. It follows that the guinea-pig method of isolating *Br. abortus* is unreliable if the milk contains tubercle bacilli.

G. S. WILSON.

Reprinted from "Bulletin of Hygiene," Vol. 12, No. 1.

DEPT. SCIENT. & INDUST. RES. **Report of the Food Investigation Board for the Year 1935** (SMITH, F. E., Chairman). 1936, pp. x + 232, with 80 figs. (1 on 1 pl.). London: H.M.S.O. Price 3s. 6d.

As for previous reports the present volume outlines a bewildering number of investigations, many incomplete and unfinished, but all tending to lay a firm foundation of scientific knowledge as to the very complex problem of food preservation. The various foods investigated are so numerous that progress is bound to be slow. Some of the problems studied at present are purely technical, others are closely related to practical conditions. It is only possible in a review to indicate broadly some of the investigations undertaken.

The first section deals with meat and includes further studies of the changes in the proteins of muscle during rigor mortis, experiments on the factors governing the evaporation of water from the surface of meat and a study of the mechanism of the oxidation of hæmoglobin to methæmoglobin by oxygen. The second contains some interesting observations on the commercial storage of eggs. The section on pork, bacon and ham includes a variety of studies, one dealing with the gas storage of bacon.

As usual the section on fish contains many valuable and practical observations. Some are at present technical only, such as the one on the estimation and identification of the amino acids of the protein of fish's muscle, others are more practical, such as those on freezing and cold storage of herring, kippers and white fish, the changes in the salt curing of herrings and the bacteriology of the haddock. Section V on fruit and vegetables runs to seventy-eight pages. Much useful information has been acquired on the cold storage and gas storage of pears; further studies are included upon the temperature and duration of life in apples, nitrogen

metabolism in apples, volatile products of fruit, and wraps in the prevention of food rotting. The important practical question of acetaldehyde vapour in relation to fruit preservation has been reinvestigated. Other practical questions studied deal with the storage of vegetables, the conditioning of cold-stored fruit prior to retail, the effect of the container on the wastage of packaged fruit, the freezing of vegetables and the resistance of the apple to fungal invasion.

The section on canning mostly deals with various factors connected with the corrosion of the container. These open new ground such as the effects of small quantities of antimony and bismuth in tin in increasing its resistance to acid corrosion. An important research deals with the effect of sugar in increasing tinplate corrosion and the factors concerned. There is a good deal of fresh matter on the corrosion of aluminium. The last section deals with a number of engineering problems.

The comprehensive researches carried out show how valuable and far-reaching is the work of the Food Investigation Board.

W. G. SAVAGE.

Reprinted from "Bulletin of Hygiene," Vol. 12, No. 1.

MCCANCE (R. A.), WIDDOWSON (E. M.), and SHACKLETON (L. R. B.). **The Nutritive Value of Fruits, Vegetables and Nuts.**—*Med. Res. Council Spec. Rep. Ser. No. 213.* 1936, 107 pp., with 26 figs. London: H.M.S.O. Price 2s.

"Hitherto unsuspected entities of food are continually being recognized as of importance in nutrition. This fact alone is enough to necessitate new analyses of foodstuffs." The mere chemical analysis of a food, however, may be misleading as a guide to its nutritional value, because some of the material estimated may not be available for nutrition. For example, about half the phosphorus of phytin passes through the alimentary canal without being absorbed, so that phytin phosphorus determinations are necessary as well as total P before the available P of a food can be estimated. A similar discrepancy may exist between total and available iron in foodstuffs. Investigators in planning nutritional experiments must recognize this possibility, that the total content of a given factor is not necessarily available for nutrition. This report deals with the titratable acidity, reducing sugar content, starch, total solids, water, N, total and phytin phosphorus, Na, K, Ca, Mg, Cu, Fe and Cl content of vegetables, fruits and nuts. The book is divided into three parts. The first part is a description of the analytical methods used for the above determinations. The second part deals with the chemical composition of some 140 English plant foodstuffs, giving also the nature of their waste, their roughage content, and the method and time of cooking them. A broad comparison of the results shows that fruits are high in sugar content (often 10 per cent), but contain no starch (with the exception of the banana), while vegetables mostly contain starch (20 per cent in the potato), although the beetroot

contains a large amount of sugar. Nuts contain little sucrose and starch but large amounts of complex carbohydrate probably not available for food. Nuts, unlike fruit and vegetables, contain large amounts of fat and protein.

The third part of the report deals with the changes in chemical composition of food brought about by different methods of cooking. These methods, such as boiling, steaming, roasting, frying, are discussed in detail, and the influence of time, volume of water, skin, size of piece, solubility of constituents, and pH of cooking water on the losses of nutritional factors during cooking is investigated. The soluble constituents suffer large losses during cooking, but there is little loss of Ca. The skin of potatoes prevents almost completely the outward diffusion of salts. Alkali in the cooking water makes little difference to the loss of salts. The waste incurred by throwing away the cooking water is surprisingly small, the retention of the water increasing the Ca, P and Fe in a mixed diet by no more than 3 per cent. Potatoes lose water when cooked in air, and potatoes and bread absorb fat on frying so that their calorific value is trebled.

DOUGLAS C. HARRISON.

Reprinted from "Bulletin of Hygiene," Vol. 12, No. 1.

Reviews.

BAINBRIDGE AND MENZIES' ESSENTIALS OF PHYSIOLOGY. (Eighth Edition.) Edited and revised by H. Hartridge, M.A., M.D., Sc.D., M.R.C.P., F.R.S. London: Longmans, Green and Co., Ltd. Pp. x + 651. Price 14s.

The eighth edition of this book has been completely revised by Professor Hartridge and should be of even more value, particularly to the medical student, than previously. The reviewer used the book as a second year student and the increased matter now included in it is really surprising. It is of more value than ever as a standard textbook.

The reading matter is set out in an attractive way with bold type, an especially pleasing point being the subdivision into paragraphs with easily legible headings. New illustrations have been included with useful diagrams and comparative tables, while biochemistry is dealt with in accordance with its ever-increasing importance in relation to the bodily functions in health and disease.

A very useful addition at the end of each chapter is the list of diseases which will bring about alteration in the particular system under discussion. The average student is liable to put his physiology in a water-tight compartment and forget its relation to medicine proper, nor does he realize how a sound knowledge of the working of the body in health will help him with his study of the body in disease.

The chapters on the central nervous system have been expanded largely and new diagrams added. As more difficulty is experienced with this system than with any other, it is of the greatest use to have a really good account of it.

A good index is provided and enables subjects to be referred to with the minimum of trouble. The whole book is most readable and should be very popular with all who need a reference book on physiology.

P. T. L. C.

TRACHOMA. By A. F. MacCallan, C.B.E., M.D., F.R.C.S. London: Messrs. Butterworth and Co. (Publishers), Ltd. 1936. Pp. xvii + 225. Price £1 1s.

This monograph, which replaces the author's "Trachoma and its Complications in Egypt" (1913), that well-known slim volume of seventy pages, now out of print, is divided into nine chapters: (1) Introduction. (2) Clinical manifestations. (3) Sequelæ. (4) Complications. (5) Differential diagnosis. (6) Treatment. (7) Pathological anatomy. (8) Epidemiology. (9) Historical. It is a volume of 225 pages with 24 illustrations, 15 of these being in colour.

The book should be welcomed by all medical officers who are brought into contact with this widespread and intractable disease.

The clinical manifestations of trachoma in all its stages are clearly and fully described, and are amplified by excellent coloured illustrations. This chapter and that on treatment with its lucid descriptive detail, will perhaps particularly appeal to the medical officer who has, without specialist aid, to deal with the disease, while the ophthalmologist will appreciate the comprehensive account of trachoma in all its aspects throughout the book.

A feature which particularly appeals to the reviewer is the precise detail given regarding diagnosis, methods of treatment, manipulations and operative procedures, which makes the book of so much greater value to the medical officer far from specialist help. This book is strongly recommended to anyone interested in trachoma.

J. B.

ON THE INCIDENCE OF ANÆSTHETIC COMPLICATIONS AND THEIR RELATION TO BASAL NARCOSIS. By C. J. M. Dawkins, M.A., M.D., B.Chir., D.A., with a foreword by Joseph Blomfield, O.B.E., M.D. Published for the Middlesex Hospital Press by John Murray, Albemarle Street, London, W. 1936. Pp. vii + 56. Price 3s. 6d.

This work, a thesis published in book form, includes a careful and exhaustive analysis of 16,000 anæsthetics given at several London hospitals and including those in the author's own practice.

It is intended to bring out the fact that preliminary basal narcosis augments in a very definite degree the incidence of pulmonary complications following anæsthesia. Such complications are always the bugbear of the anæsthetist, and his statistics, taking two periods, 1921-1925 (prior to the introduction of basal narcotics) and 1931-1935 (after their established use), show that sequelæ of this nature are almost doubled.

It is important to bear this in mind owing to the increasing demand by the public for this type of anæsthesia—enhanced by the many articles in the popular Press.

The book is very readable and has ninety references, and though in practice statistics are not infallible, it is thought that the author has proved his point. L. M. R.

RESEARCH ON THE LOW POTENCIES OF HOMŒOPATHY. By W. E. Boyd, M.A., M.D.Glas. London: William Heinemann (Medical Books), Ltd. 1936. Pp. 38. Price 2s. 6d.

This monograph gives an account of the method of preparation of the homœopathic potency. Research methods are described by which investigations were carried out on: (1) An insoluble metal; (2) a salt; (3) a simple organic substance; (4) a radio-active salt; (5) organic substance containing alkaloids.

By these methods low potencies of various homœopathic preparations were shown to be capable of identification by 'spectroscope, fluorescent and Geiger counter methods.

The author points out that the action of homœopathic preparations is specially selective and individualistic. A. G. B.

Notice.

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Original Communications.

"DOWNWARD DISPLACEMENT" DISINFECTION: BLANKETS
AND WEBBING EQUIPMENT.

BY MAJOR H. A. SANDIFORD, M.C., M.B.
Royal Army Medical Corps.

PART I.—BLANKETS.

EXPERIMENTS were undertaken to determine the following points :—

- (1) Whether water is added to blankets during downward displacement disinfection.
- (2) Whether shrinkage occurs in disinfection.
- (3) The amount of "wear and tear" due to disinfection.

APPARATUS USED.

The experiments were carried out in an experimental lorry disinfector in which the disinfecting chamber is a metal cylinder, 4 feet 4 inches in length and 2 feet 10 inches diameter, internally. The chamber is mounted on a stand so that it can be swivelled round like a churn. After being packed with blankets the chamber is inverted before being connected to the steam supply.

METHOD OF CARRYING OUT EXPERIMENTS.

Sixty new general service blankets were obtained from R.A.O.C. Depot and numbered from 1 to 60. The blankets were measured—the two diagonal measurements being selected as the blankets were not true rectangles. The blankets were next weighed—this being their weight as issued by the R.A.O.C. Depot.

The blankets were then dried at 50°C for two hours and weighed in the hot air chamber—the "initial dry weight" being thus obtained.

The following procedure was carried out on each of six occasions :—

(a) The blankets, in dozens, were weighed in the open air ; at the same time the relative humidity was calculated.

(b) The blankets were then packed in the disinfector chamber. Blankets 1 to 12 were first packed, then 13 to 24, 25 to 36, 37 to 48, and lastly 49 to 60. The same order of packing was used on each occasion. It should be noted that, as is usual in a downward displacement disinfector, the chamber was inverted after packing, before coupling the steam pipe from the boiler to the chamber. The result was that blankets 1 to 12 were exposed to steam for the longest period and blankets 49 to 60 for the shortest period, on each occasion.

(c) Steam was allowed to enter the chamber until it issued from the bottom of the chamber in full volume, that is the issue of steam was allowed to attain its maximum flow and thereafter the maximum flow was maintained for one minute.

(d) The steam pipe was next disconnected from the chamber, which was then re-inverted in order to empty it. Blankets Nos. 60 to 49 were first removed, then 48 to 37, 36 to 25, 24 to 13, and finally 12 to 1 ; it will be noted that blankets 12 to 1 were always the last to be removed from the chamber. Owing to the necessity for identifying each blanket as it was removed from the chamber, the emptying of the chamber took a longer time than would normally be the case.

(e) On removal from the chamber each blanket was given a " standard shake ", i.e. it was opened out, grasped by a man at each corner and shaken eight times, i.e. eight upward and eight downward movements.

Removal of all the blankets from the chamber and shaking took from ten to twelve minutes.

After having been shaken, the blankets, collected into their respective dozens, were either hung on lines in the open air or dumped in piles on a hand cart.

(f) When the disinfecting chamber had been completely emptied the blankets were folded and weighed in their dozens. Those blankets which had been collected into piles were weighed first. The blankets which had been hung on the lines were next weighed and the time that they had been hanging was noted.

After the procedure noted above had been carried out on six occasions, the blankets were dried at 50°C for two hours and weighed, thus the " second dry weight " referred to in the Tables was obtained.

The blankets were finally inspected for tears and re-measured.

Table I records the weight of the blankets in dozens, before and after disinfection, on 6 occasions. It will be seen that out of 30 dozen blankets (5 dozen disinfected 6 times) only 2 dozen failed to gain weight in the process of disinfection.

TABLE I.—RESULTS OF EXPERIMENTS.

Date	Relative humidity	Blanket numbers	Blanket weights by dozens		Gain per dozen blankets in ounces	Period blankets hung on line in minutes
			Before disinfection	After disinfection		
1936			lb. oz.	lb. oz.		
August 31	74.3	1-12	53 8	54 14	22	—
		13-24	53 2	53 6	4	20
		25-36	53 5	54 0	11	—
		37-48	53 9	53 7	-2	25
		49-60	52 11	53 12	17	—
September 1 (a.m.) ..	64.8	1-12	54 2	55 10	24	25
		13-24	53 6	54 5	15	—
		25-36	53 10	54 3	9	20
		37-48	53 9	54 5	12	—
		49-60	53 0	54 0	16	15
September 1 (p.m.) ..	73.5	1-12	55 8	57 6	30	—
		13-24	55 2	54 13	-5	40
		25-36	54 10	55 6	12	—
		37-48	54 9	54 12	3	35
		49-60	53 7	55 4	29	—
September 5	73.5	1-12	55 0	56 5	21	50
		13-24	54 11	55 10	15	—
		25-36	55 12	56 6	10	55
		37-48	54 12	55 11	15	—
		49-60	54 8	55 0	9	60
September 9	62.5	1-12	56 8	58 6	30	—
		13-24	55 4	56 4	16	52
		25-36	56 4	57 0	12	—
		37-48	55 5	55 11	6	47
		49-60	54 12	56 1	21	—
September 10	88.2	1-12	58 5	59 0	11	20
		13-24	56 5	57 8	19	—
		25-36	57 2	58 0	14	25
		37-48	56 1	57 5	20	—
		49-60	56 5	57 8	19	30

The total gain in weight on the six occasions was as follows :—

Blankets	1-12,	gained	138	ounces.
„	13-24	„	64	„
„	25-36	„	68	„
„	37-48	„	54	„
„	49-60	„	110	„

434 ounces.

The gain in weight by blankets 1 to 12 and 49 to 60 was relatively twice as much as the gain by the remaining blankets. A possible explanation of this result lies in the fact that blankets 1 to 12 and 49 to 60 were in contact with a much greater area of the internal surface of the disinfecting chamber than were the other blankets, *vide* fig. 1. Much condensation of steam occurs on the internal surface of the chamber during the process of disinfection and it is therefore reasonable to assume that blankets in contact with a larger area of surface will become wetter than those in contact with a smaller area.

The greatest gain in weight (138 ounces) was sustained by blankets 1 to 12 and these are the blankets last removed from the chamber during the process of emptying and shaking. Whilst waiting for seven to ten minutes to be removed and shaken, blankets 1 to 12 are losing heat so that there is less heat in them to evaporate the contained moisture on shaking.

The blankets which gained least weight were Nos. 37 to 48; these were one of the three dozens in contact with a smaller area of the internal surface of the disinfecting chamber and were the first of these three dozens to be unloaded on each occasion (*vide* fig. 1).

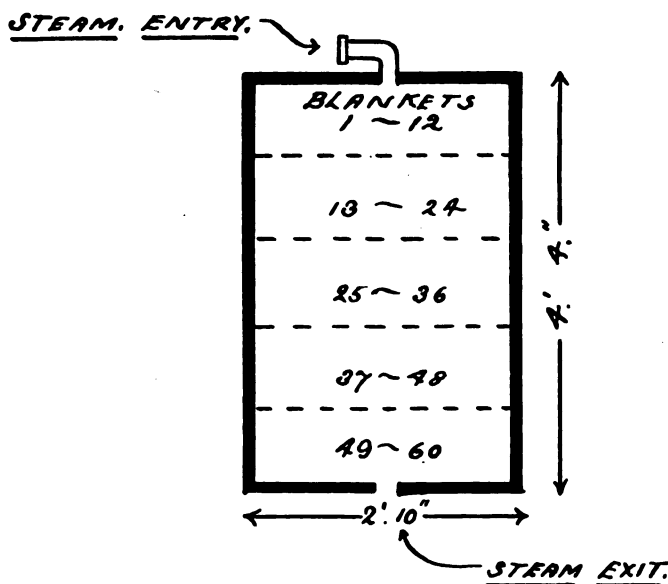


FIG. 1.

It follows from the above that it may be a disadvantage to have too large a chamber so that there is delay in completely emptying it and that sufficient personnel to enable the chamber to be emptied quickly will result in the driest blankets.

AMOUNTS OF MOISTURE ADDED TO BLANKETS.

The gain in weight of blankets after disinfection is shown in Table II. (H = hung on lines, NH = not hung on lines.)

TABLE II.—GAIN IN WEIGHT, in OUNCES, PER DOZEN BLANKETS.

Blankets 1-12		Blankets 13-24		Blankets 25-36		Blankets 37-48		Blankets 49-60	
H.	N.H.	H.	N.H.	H.	N.H.	H.	N.H.	H.	N.H.
24	22	4	15	9	11	-2	12	16	17
21	30	-5	15	10	12	3	15	8	29
11	30	16	19	14	12	6	20	19	21
56	82	15	49	33	35	7	47	43	67

The average gain in weight per blanket during disinfection on six occasions was as follows :—

Blankets 1-12 and 49-60	When hung on lines = 1·4 ounces When not hung on lines = 2·0 ounces	} Average 1·7 ounces.
Blankets 13-24 and 25-36 and 37-48	When hung on lines = 0·5 ounce When not hung on lines = 1·2 ounces	
		} Average 0·9 ounce.

To enable one to visualize these amounts of water it may be stated that if a blanket were exposed to heavy rain (2 inches in twenty-four hours), it would receive on one surface 1·7 ounces of water in twenty-four seconds approximately.

A dry blanket conserves body heat by minimizing heat loss by conduction and convection, but a damp blanket increases heat loss by these methods. This increased heat loss will tend to cause discomfort and possibly "chill" in a resting man and will continue until the moisture has been evaporated from the blanket.

The second point brought out by Table I is the progressive increase in weight due to moisture of all the blankets during the period of the experiments. This progressive increase is due to the fact that the blankets were not completely dried between experiments and whilst its occurrence does not invalidate the present series of experiments, it is worth noting as a possible factor in other series. The progressive increase in moisture content of the blankets is in itself evidence of the effect of disinfection upon them.

The effect of hanging the blankets on lines in the open air after disinfection is shown in Table II. The minimum period blankets were so hung was fifteen minutes, the maximum sixty minutes, and the average thirty-six minutes. The figures are too few to permit of conclusions as to the optimum period the blankets should be aired on lines; other factors, such as relative humidity, air movement and temperature and time available, need to be taken into consideration. At this stage it is possible to conclude that airing the blankets after disinfection for a period of from fifteen to sixty minutes results in drier blankets.

It was not found practicable during the course of the experiments to feel every blanket completely to ascertain whether the blankets felt "damp." Many blankets were so examined with the following results :—

- (1) Occasionally blankets were too damp after disinfection to be fit to use.
- (2) Dampness was especially noticeable in limited portions of blankets, i.e. where the blanket had been grasped by the hands in shaking.
- (3) On September 10 the blankets, as a whole, were very damp after disinfection and unfit for use.

It is of great interest to note the amounts of moisture contained in the blankets as received from the Ordnance Depot, *vide* Table III.

The blankets on receipt from Ordnance Depot were all thoroughly handled during the process of measuring them and no dampness was

appreciable, so that these blankets would have been issued unhesitatingly as fit for use.

TABLE III.

Blankets	1-12		13-24		25-36		37-48		49-60	
	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.
Received from Ordnance Depot	54	12	54	6	53	13	54	0	53	8
After drying ..	51	7	51	14	52	2	52	4	51	6
Loss in weight .. (ounces)	53		40		27		28		34	
Average loss per blanket .. (ounces)	4.4		3.3		2.2		2.3		2.8	

In this connexion it might also be of interest to ascertain the amount of moisture in blankets in use in barrack rooms: (a) in the morning after use during the night; and (b) in the evening before use and after exposure to the air of the barrack room during the day. The covering of blankets with a counterpane, as is done in civil life, may be a factor in the prevention of common colds, tonsillitis, etc., in that this tends to prevent the deposition of moisture and its absorption by the blankets during the day.

EFFECT OF RELATIVE HUMIDITY ON DRYNESS OF BLANKETS.

The effect of the relative humidity of the air to which the blankets were exposed on the six occasions after disinfection cannot be clearly demonstrated owing to the small number of observations and interference by other factors, e.g. air movement. It may be noted that on September 10, although the relative humidity was very high (88.2 per cent), the blankets hung on lines were no wetter than those not exposed to the damp air. Dry blankets, being woollen, readily absorb moisture on exposure to damp air and in the presence of an extreme degree of relative humidity it would obviously be a disadvantage to expose them on lines after disinfection.

SHRINKAGE OF BLANKETS DUE TO DISINFECTION.

The blankets were measured from corner to corner, to obtain two diagonal measurements, before and after the series of six disinfections, with the following results:—

- 3 Blankets were unchanged in their measurements.
- 17 Blankets gained on both diagonals. Average gain on each diagonal 1.5 inch.
- 6 Blankets lost on both diagonals. Average loss on each diagonal 1.7 inch.
- 12 Blankets gained on 1 diagonal, unchanged on the other. Average gain 0.9 inch on the one diagonal.
- 9 Blankets lost on 1 diagonal, unchanged on the other. Average loss 1.5 inch on the one diagonal.
- 13 Blankets gained on 1 diagonal, lost on the other. Average gain 1.3 inch, average loss 1.4 inch.

The accurate measurement of blankets is not easy owing to their tendency to stretch. In spite of this, however, it would appear that any distortion or shrinkage of the blankets which occurred was of small degree and not such as to affect the serviceability of the blankets.

An attempt was made to ascertain whether the "unevenness" of downward displacement disinfection affected the shrinkage of the blankets. It will be remembered that blankets 1-12 were exposed to the action of the steam longer than the other blankets. An average period of fifteen minutes elapsed between the time steam was applied to the chamber and the time it appeared at the exit. During this period the steam was steadily descending through the chamber so that it required on an average three minutes for the steam to penetrate each dozen of the blankets, *vide* fig. 1. During the first three minutes, when blankets 1-12 were being penetrated by the steam, they may be considered to have been at steam temperature for an average period of one minute. After the first three minutes of steam entry, blankets 1-12 were necessarily at steam temperature for a further twelve minutes, whilst the remaining four dozen blankets were penetrated.

The whole of the blankets were at steam temperature for one minute whilst the maximum flow of steam was allowed to issue from the bottom of the chamber.

In comparing blankets 1-12 with 49-60 the periods the blankets were at steam temperature are as follows:—

First dozen (blankets 1-12) $1 + 12 + 1 =$ fourteen minutes.

Last dozen (blankets 49-60) $1 + 1 =$ two minutes.

The blankets were disinfected on six occasions so that the total exposure periods become eighty-four minutes for the group 1-12 and twelve minutes for the group 49-60, i.e. the first group (1-12) was exposed to the steam seven times as long a period as the last group (49-60).

A comparison of the changes in the diagonal measurements of the blankets 1-12 and 49-60 before and after disinfection gave the following results:—

	Blankets 1-12	Blankets 49-60
Unchanged	1	3
Gained on both diagonals	2	1
Lost on both diagonals	2	2
Gained on one diagonal, unchanged on the other	4	0
Lost on one diagonal, unchanged on the other ..	0	2
Lost on one diagonal, gained on the other ..	3	4

The average loss in length on the diagonals for blankets 1-12 was $3\frac{1}{2}$ inches and $1\frac{1}{4}$ inches, and for blankets 49-60 was $1\frac{1}{2}$ inches and 1 inch.

In the case of the blankets which lost on one diagonal and gained in length on the other, the average loss was 2 inches for blankets 1-12 and $\frac{3}{4}$ inch for blankets 49-60.

The figures are too few to permit of accurate conclusions being drawn, but it would appear that blankets 1-12 sustained little, if any, more shrinkage than 49-60 in spite of their disproportionate exposure to steam.

AMOUNT OF WEAR AND TEAR DUE TO DISINFECTION.

In previous experiments with downward displacement disinfectors it has been noticed that a considerable amount of fluff (woollen fibres) from the blankets collected on the floor around the disinfecter, and it was thought that the shaking of the blankets caused considerable loss of substance such as is seen in old blankets, and results in loss of the heat-insulating properties of the blankets.

In the present series of experiments sixty new blankets were obtained, dried at 50° C. for two hours and weighed. After being disinfected and shaken on six occasions, they were dried at 50° C. for two hours and re-weighed.

The comparison between the initial and second dry weights of the blankets is as follows:—

TABLE IV.

Blankets	1-12		13-24		25-36		37-48		49-60	
	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.
Initial dry weight 27.8.36	51	7	51	14	52	2	52	4	51	6
Second dry weight 17.9.36	52	0	51	2	50	2	50	0	51	0
Difference (ounces)	+9		-12		-32		-36		-6	
Average per blanket (ounces)	+0.75		-1		-2.7		-3		-0.5	

It will be noticed that there are considerable variations in the above differences and that blankets 1-12 had apparently gained weight. These anomalies are due to the fact that drying at 50° C. for two hours is probably not sufficient to bring the blankets to a constant weight. The second drying was carried out when the blankets were comparatively wet (cf. the weight of the blankets as received from Ordnance and their weight after disinfection on September 10, 1936) and although the blankets dried relatively evenly they were probably insufficiently dried as compared with initial dry weight, *vide* Table V below:—

TABLE V.

Blankets	1-12		13-24		25-36		37-48		49-60	
	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.
Weight after disinfection 10.9.36	59	0	57	8	58	0	57	5	57	8
Second dry weight 17.9.36	..	52 0	..	51 2	..	50 2	..	50 0	..	51 0
Difference (ounces)	..	112	..	102	..	126	..	119	..	104

Average difference 112 ounces.

It is possible to conclude that there was a loss of substance averaging 1 to 2 ounces per blanket, during the experiments, *vide* Table IV. Granted, however, that the above loss occurred, it by no means follows that disinfection (including shaking) causes more loss of blanket substance than does normal use, nor that the loss of substance is of such magnitude as to render the blanket unserviceable. The average weight of an

"unserviceable" blanket is about $3\frac{1}{2}$ pounds, whilst the average weight of a new blanket in the present series of experiments was $4\frac{1}{2}$ pounds, so that a loss of 2 ounces might be expected to diminish the blanket's efficiency by less than 3 per cent. Recently the writer had the opportunity of seeing some 600 new blankets taken into use in hospital wards, and for several days afterwards a considerable amount of "fluff" was daily swept up from the ward floors, showing that loss of substance is particularly apt to occur with new blankets.

In addition to the loss of substance noted above, three of the blankets were slightly torn during the process of shaking, but the tears were insufficient to cause the blankets to be condemned for use.

SUMMARY.

(1) It was found that blankets after disinfection in a downward displacement disinfector contained more moisture than before disinfection, and that the amount of moisture gained varied from 0.5 to 2.0 ounces per blanket.

(2) Blankets at the bottom and top of the disinfecting chamber were found to gain twice as much moisture as blankets occupying intermediate positions in the disinfecting chamber.

(3) Blankets exposed to the air on lines for periods varying from fifteen to sixty minutes, after disinfection, were found to be drier than blankets not so exposed.

(4) The following measures will assist in ensuring dryness of the blankets: (a) Adequate personnel, so that the chamber is quickly emptied and blankets thoroughly shaken; (b) provision of drying lines.

(5) The following measures may assist in ensuring drier blankets: (a) An old blanket should be used to line the steam entry end of the disinfecting chamber so as to absorb the moisture condensed on the end surface and protect the other blankets; (b) an old blanket may similarly be used at the steam exit end of the chamber; or (c) a false bottom of wire mesh may be inserted at the steam exit end of the chamber to keep the blankets from contact with the end surface.

(6) Blankets were found to suffer little or no shrinkage during the process of being disinfected on six occasions.

(7) A small degree of wear and tear due to disinfection (including shaking) was observed; there is no evidence to say whether the wear and tear was abnormal as compared with that resulting from ordinary usage of blankets in barrack rooms.

PART II.—WEBBING EQUIPMENT.

The experiments were designed to ascertain: (1) Whether webbing can be disinfected by "downward displacement" disinfection; and (2) if the process ruins the webbing.

Method.—A webbing pack and a webbing cartridge carrier were obtained

in new condition from R.A.O.C. Depot. On each of six occasions the following procedure was carried out :—

(1) A temoine tube (containing exalgin and powdered Leishman stain) was placed in each of the five pouches of the carrier.

(2) Four temoine tubes were placed loosely in the pack.

(3) Three temoine tubes were wrapped in an old blanket, and this was placed in the pack which was then fastened.

(4) The pack and cartridge carrier were packed in the centre of the disinfecting chamber amidst blankets, on each of the six occasions when blankets were disinfected (*vide* Part I).

(5) Whilst the chamber was being emptied of blankets, the pack and carrier were examined to ascertain if the exalgin had been melted.

RESULTS.

On every occasion the exalgin had melted in all the tubes, showing that a temperature of 100° C. had been attained inside the pack and pouches.

The pack and carrier were exposed to steam temperature for a total period of approximately fifty minutes. On examination after the last experiment no evidence of deterioration of the webbing material was seen.

During the writer's absence in Palestine, the Commandant, Army School of Hygiene, carried out further experiments.

A pack and a cartridge carrier were disinfected six times in the pressure disinfector (5 pounds) at the Command Disinfestation Centre.

A haversack and a cartridge carrier were disinfected six times in the pressure disinfector (20 pounds) at the Cambridge Military Hospital.

No evidence of deterioration was apparent after these disinfections.

The whole of the articles (two packs, one haversack and three carriers) were then forwarded to the War Office for expert opinion as to whether deterioration had occurred, and a report was received that no damage had been sustained by the articles.

CONCLUSIONS.

These experiments, though small in number, would appear to warrant the conclusion that webbing can be disinfected by steam in a “downward displacement” disinfector, and that little or no deterioration of the material is caused by steam disinfection.

ACKNOWLEDGMENTS.

I am indebted to the Commandant, Army School of Hygiene (Colonel A. C. Hammond Searle, M.C.), for his advice and suggestions whilst carrying out the experiments and also for permission to send this report for publication. I also wish to acknowledge the help of Serjeant Dugmore, R.A.M.C., who assisted me during the experiments.

GENITAL WARTS.

BY LIEUTENANT J. F. WILSON,
Royal Army Medical Corps.

INTRODUCTION.

"GENITAL WARTS" were chosen as a subject for study as the clinical material was available through the kindness of Dr. Batchelor, the Physician-in-Charge of the Venereal Diseases Department of the Royal Infirmary, Edinburgh.

The primary object was not to complete a set piece of research, but to learn how to deal with a given problem and to learn the various methods of technique which were required.

Accordingly the work is incomplete. As only a limited amount of time was available, most of the necessary controls had to be omitted and none of the experiments could be repeated. It is hoped, however, that this may form the basis for future work.

Dr. Green, of the Department of Bacteriology, very kindly carried out any animal injections that were necessary and demonstrated the bacteriological methods.

I should like to thank Professors A. Murray Drennan and T. J. Mackie for the facilities of their departments.

CLINICAL APPEARANCE.

The terms Moist Wart, Gonorrhœal Wart, Venereal Wart, Venereal Vegetations, and Condylomata Acuminata, have all been used to describe the papillomata which occur on the genital regions of both males and females. These lesions are pedunculated, branching, wart-like growths. They vary in size from minute specks, only just visible to the naked eye, to large cauliflower masses which are often superficially infected. If they become flattened by pressure, there may be some difficulty in distinguishing them from the flat sessile condylomata lata of syphilis.

In the male they are usually present in the coronal sulcus, on the mucosal surface of the prepuce and on the glans penis. In one case, treated by Dr. Batchelor, they extended down the whole length of the penile urethra. The number present varies from one to thirty or more.

In the female, they were found on both surfaces of the labia majora and labia minora and around the urinary meatus and anus. The whole of the external genitals and perineum may be covered by one large cauliflower mass.

Owing to their position and size, they may cause great discomfort and the treatment can be difficult. In spite of this, there still appears to be some confusion as to the ætiology of the condition, as is evident from the variety of names used.

Eighteen patients with genital warts were seen in the Royal Infirmary between November, 1935, and May, 1936. Of these fifteen were males and three females. These figures do not represent the true frequency of the condition in the two sexes as most of the work was carried out in the male department, and only a few female cases were seen.

The frequency of concurrent conditions was :—

			Total No.	Gonorrhœa	Syphilis	Common warts on hand
Males	..	..	15	7	2	1
Females	..	..	3	—	—	1

In addition, three of the males had a non-specific balanitis, in one case associated with a very painful paraphimosis caused by the warts. Two of the females were pregnant, and the other had been delivered two weeks before she was examined with a view to treating the warts. All the females had a profuse discharge.

CONNEXION WITH VENEREAL DISEASES.

Syphilis and other Spirochætal Diseases.—The idea that genital warts are caused by syphilitic infection probably arose from the apparent similarity which may be present between the warts and condylomata lata which are true syphilitic lesions. The two conditions may coexist, and antisyphilitic treatment may appear to cure the warts. This has apparently led to some confusion in the past, but it is now generally recognized [24] that there is no connexion between the two lesions. It will be seen that only two, out of the eighteen patients in this series, suffered from syphilis.

Condylomata lata were known to be caused by *Spirochæta pallida*, and when it was found that genital warts were not syphilitic in origin attempts were made to describe other spirochætes as the causal organisms. If the warts become superficially infected, and if spirochætes of any type are present, it is possible that they could be found in suitably stained sections of the wart. This may be the explanation of at least some of the various forms of spirochætes which have been described.

Schaudinn and Hoffmann [4] found in sections a spirochæte which they thought was *Sp. refringens*. In 1919 Civatte and Favre [5] stained sections of venereal warts with iron-hæmatoxylin and described the presence of three types of spirochætes. Two types were always associated and formed intracellular and extracellular "spirochætal tufts" which they considered characteristic. These organisms did not correspond with either *Sp. refringens* or *Sp. pallida*. This work has never been confirmed.

Gonorrhœa.—For many years the name gonorrhœal wart was used. Harrison [6] states that venereal warts are indirectly due to gonorrhœa

and are a local complication of that disease. "They are due to irritation of discharges, and, since the female genitals favour moisture and retention of discharge, they are much more commonly a prominent feature in women than in men."

The warts appear to reach their largest size in women but the discharge, though it may play some part, is not the only factor determining size for the warts tend to increase in size during pregnancy and to decrease after its termination [1, 7, 12].

Of the cases seen, very large growths of warts were observed in three women who were, or had been, pregnant. This increase in size appears to start early as one of these women was only at the third month. There was no opportunity to observe the reported diminution in size as treatment was commenced soon after delivery.

None of these three patients had either syphilis or gonorrhœa but they all had a persistent, copious discharge, and it may be that this, combined with the increased blood supply to the parts, was responsible for the striking appearance of the lesions. There must, however, be some other factor present for two of the males had had only a few minute warts for over a year; in spite of the fact that the parts were moist and filthy and that latterly one had had a balanitis and the other a profuse gonococcal discharge. It therefore seems likely that the striking variation in size must be connected in some way with the pregnancy.

The warts were at one time considered to have an even more direct connexion with gonorrhœa as is shown by the Report by Armstrong [8] (1913) of a case of "gonorrhœal warts" of the face which was successfully treated by a gonococcal vaccine.

As with syphilis it has been found that the presence of the warts may be entirely independent of a gonococcal infection and out of the present series of eighteen cases only seven suffered from gonorrhœa.

Goodman and Greenwood [10] stress the tendency of all warts to undergo spontaneous cure and show the need for rigid controls if any conclusions are to be drawn from the results of treatment. Therefore, cures occurring during treatment for syphilis or gonorrhœa do not give any indication of the ætiology of the warts.

It appears that in general about two-thirds of the patients with "genital" warts are free from other disturbances of the genito-urinary tract (Frey [9]).

INFECTIVITY—CLINICAL AND EXPERIMENTAL.

Clinical.—It is now well recognized clinically that these warts are infectious and may be transmitted by contact [24]. All the patients observed, with two exceptions, admitted exposure to possible infection. And in two cases a clear history was obtained of their appearance some time after intercourse with a person already infected with warts.

A waiter reported at the out-patient department of the Royal Infirmary,

Edinburgh, complaining of a sub-prepuccial discharge. On examination, he was found to be suffering from a non-specific balanitis. In addition, the glans penis, coronal sulcus and undersurface of the prepuce were covered with small flat warts. No gonococci were found in smears and both the Wassermann reaction and gonococcal fixation test were negative. On being asked if he knew what caused the condition he gave a definite history of having had intercourse for some months with a consort who had genital warts.

Another possible source of infection was suggested by the observation by Rasch (1900) of the frequent simultaneous appearance of "fig-warts" on the genitals and common warts on the hands. A similar observation was made by Brandes (1925 [10A]) who recorded that in a series of thirty-eight cases of "fig-wart," 70 per cent also had *verruca vulgaris*. Frey also noted that 50 per cent of his cases had both genital and common warts. These figures are interesting as only two out of the present series of eighteen cases had both types of warts.

Experimental.—There is abundant experimental evidence of the infectious nature of warts in general. This work has been summarized by numerous authors [1, 10, 11, 12] and only a brief outline will be given.

Warts have been transmitted on numerous occasions but always to man and their transmission to animals appears to be very difficult, if not impossible. In 1893 Variot successfully inoculated an adult from a child and in 1896 Tadasshon transmitted the lesions in forty-one cases out of seventy-six. Lanz (1899) and Tulliusberg (1903) also succeeded in transmitting them obtaining incubation periods of six and seven weeks respectively.

Animal inoculation was attempted unsuccessfully by Serra (1924) and Findlay (1930 [1]), but Ullman (1923) claimed to have transmitted a laryngeal papilloma to the vagina of a bitch.

The infective agent is probably a filter passing virus as Ciuffo (1907), Serra (1908), Wile and Kingery (1919), Kingery (1921) and Findlay (1930) all obtained infective filtrates.

It is evident that this virus causes not only genital warts but also common warts and laryngeal papillomata. Waelsch (1918) obtained flat warts on the skin and papillomata on mucous membranes by injecting material prepared from a fig-wart. Wile and Kingery (1919 [2]), who confirmed Ciuffo's earlier work, produced more conclusive results by obtaining typical common warts by injecting the sterile filtrate of ground-up "warts and condylomata acuminata." This relationship was also proved by Serra in 1924, the one lesion being produced by ground-up material from the other. Both these earlier observations were confirmed by Findlay in 1930.

The occurrence of laryngeal papillomata in association with flat warts of the skin had been noted by Werner (1894) and Thost (1911), and Ullman (1923) was able to transmit the papillomata by means of a sterile

filtrate. As the papillomata of mucous membranes may become malignant and if, as is likely, they may be caused by the virus of the common wart, the demonstration of this virus becomes of importance.¹ Owing to the size and frequency of the lesions, the genital wart offers a better source of experimental material than either the papilloma or the common wart.

The following experiments were carried out with a view to testing the possibilities of demonstrating the presence of the virus. No attempt was made to transmit the warts to man as the incubation period appeared rather long for the present investigation; for although Wile and Kingery (1919) [2] induced lesions in four weeks, Serra (1908) and Kingery (1921) [3] found that the incubation period was about six months.

MICROSCOPIC EXAMINATION.

All the sections examined from nine different warts had essentially the same histology.

In the fully developed wart the normal interpapillary projections of the skin have become elongated and thickened and there is an overgrowth of the malpighian layer. As a result, the covering epithelium is thrown into folds and a typical papilloma is produced.

The interpapillary projections form the connective tissue core which is cellular and contains numerous thin-walled blood-vessels.

The cells of the basal layer of the epidermis are larger than normal but they still maintain their columnar shape. Immediately above them are several layers of polyhedral cells which form the rete malpighii, or prickle-cell layer. The cells of this layer undergo various degenerative processes.

Of these the most noticeable is that in many of the cells the nuclei contain several nucleoli, five or six being present in one nucleus. This may be due to the rapid division of the cells but is more probably an effect of cell degeneration, for a similar appearance can be seen in degenerating nerve cells and even in liver cells which are in a state of advanced cloudy swelling. As the cells get further from their blood supply in the connective tissue, the cytoplasm becomes vacuolated and the nucleus may come to lie in what appears to be a clear space bounded by the remains of the cell wall. This appearance is not seen to any marked extent in the normal skin and is probably the result of the increased thickness of the malpighian layer. The outermost cells form the stratum granulosum. The granular appearance is caused by the formation of keratohyaline and the extrusion of nuclear material into the cytoplasm where it swells up and forms homogeneous "inclusions." The thickness of this layer varied in the different

¹ Shope [25] recently described a virus as the cause of infective papillomata in rabbits which may become malignant. Handley [26] states that "this is the only instance in mammals where substantial evidence for a virus as a possible cancer agent has been produced."

warts but was never a very marked feature. Small deposits of melanin were seen in one of the warts.

Two of the warts had been treated with X-rays before they were excised. In these the changes were mainly in the connective tissue where there was a marked cellular increase. Large numbers of eosinophils were present and could be seen entering the prickle-cell layer. A few cells with a similar structure but blue granules were also present.

Warts stained with iron hæmatoxylin and by Dobell's modification of Levaditi's silver impregnation method failed to show any evidence of spirochætes of any kind.

VIRUS INCLUSION BODIES.

At the present moment there may be doubts as to the existence of virus inclusion bodies. This appears to be due to the description of inclusion bodies in every possible situation during the period following their original description. As the majority of these "inclusions" appear to have been the products of normal and degenerating cells, the whole subject naturally fell into some disrepute. It is only recently that new experimental methods have been applied and the whole matter placed on a firm foundation.

Inclusion bodies such as the Guarnieri bodies of smallpox, the Bollinger bodies of fowl-pox, and the Negri bodies of rabies are generally regarded as specific for these diseases. In addition minute granules (elementary bodies), such as the Paschen bodies of vaccinia, have been described in many virus diseases.

Goodpasture (1929 [23]) summarizes the three possible suggestions made as to their origin.

(1) That the inclusions represent stages in the life-cycle of a protozoa and that the minute bodies are of the nature of sporozoites (Calkins).

(2) That the minute bodies are the virus which invades and injures the cell. As a result, due to altered activity or degeneration, the inclusions are formed from the cellular material (Paschen).

(3) That the minute bodies are the virus which penetrates the cell. The cell envelops the virus with some plastic material and this material and the virus form the inclusion body (von Prowazek, Lipschütz).

The later work of Woodruff and Goodpasture [18] did much to prove the true nature of these inclusions and elementary bodies. The cytoplasmic inclusions had been described in fowl-pox lesions and Borrel (1904) had demonstrated the small elementary bodies which he thought were the causal organisms of the disease. Woodruff and Goodpasture digested the fowl-pox lesion with trypsin leaving the inclusions intact due to their lipid envelope. The inclusion bodies could then be separated and washed. On rupturing them they were shown to contain the elementary bodies described by Borrel. Moreover the disease was reproduced by means of the inclusion bodies alone. The agglutination of the elementary bodies by means of a specific agglutinating serum has also been demonstrated.

Bedson [16] comes to the conclusion that the fowl-pox inclusion body is a virus colony enveloped and held together by gelatinous material produced either by the cell or by the virus. This appears to represent the most modern opinion on the subject.

The cytoplasmic inclusions of molluscum contagiosum (Goodpasture and King, 1927), ectromelia (Barnard and Elford, 1931), and of vaccinia (Goodpasture, Woodruff and Buddingh, 1931) have also been shown to be packed with small refractile bodies. It is this type of inclusion which appears to be present in warts.

Before passing to a consideration of the appearances in the wart, it



FIG. 1.—Granular cytoplasmic inclusion and nuclear changes. Stain eosin and methylene blue. ($\times 1400$.)

might be well to note the modern conception of intranuclear inclusions as described by Bedson [16]. They consist of two types:—

(1) An inclusion occupying the whole nucleus and separated from the nuclear membrane by a clear space. The nuclear chromatin is arranged in irregular clumps round the periphery of the nucleus.

(2) A nucleus with an hypertrophied nucleolus and small basophilic inclusions.

It should be noted that Lee [17] produced various nuclear inclusions by chemical means. In addition they must be very difficult to distinguish from dividing and degenerating nuclei. Therefore, as I have never seen any intranuclear inclusions for comparison, I have not attempted to describe them in the wart though various suggestive appearances have been noted.

Virus Inclusions in Warts.—Findlay [1] summarizes the inclusions which have been described previously in all types of warts. Sanpelice (1913), Lipschütz (1924), and Ullmann (1923) all described intranuclear inclusions which Kyrle (1925) regards as oxychromic changes of the nucleoli. Similar nucleolar changes are present in early psoriasis lesions and also in rabbit warts caused by *Sp. cuniculi*.

Acidophilic cytoplasmic inclusions were described by Sangiorgi (1915) and by Lipschütz (1924). Findlay considers that those described by Sangiorgi "are almost certainly nucleolar extrusions." There is thus no definite information with regard to wart inclusion bodies.

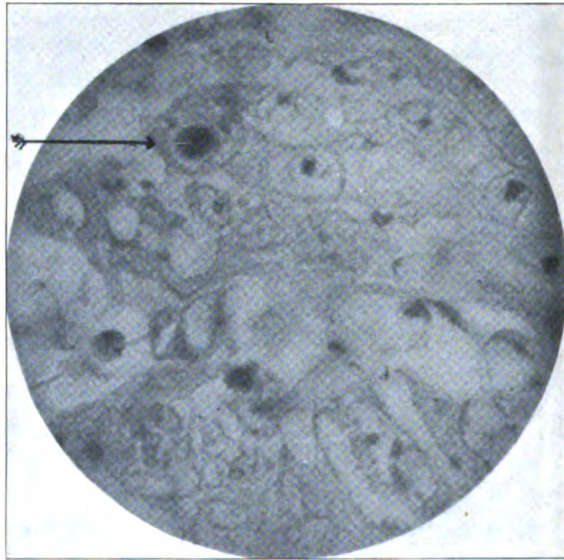


FIG. 2.—Granular eosinophilic inclusion in the cytoplasm of a cell showing the indented nucleus. Stain eosin and methylene blue. ($\times 1000$.)

The whole subject of intracellular inclusions is especially difficult in epidermal tissues where the formation of keratohyaline leads to cellular degenerative changes and the formation in the cell of homogeneous granules (Ludford, 1924-25 [13]). There is also the possibility of these granules being carried by phagocytes towards the connective tissue core of the wart. This was seen in one case. Unless care is taken, eosinophils present in the malpighian layer may be confused with prickly cells containing eosinophilic granules. Where the nucleus is present, the differentiation is not difficult, but the granules may become separated from the nucleus and lie free among the epithelial cells.

If the above possibilities are excluded, there still remain some inclusion-like bodies present in practically every section made from the genital warts.

These inclusions were roughly spherical bodies staining more deeply with eosin than the surrounding tissues. They were never very numerous in any of the sections examined, although in a few they occurred frequently in a small area. The majority were situated in the basal layer of the epidermis and none were seen in the connective tissue.

In relation to the individual cells they were either definitely in the cytoplasm or lying free surrounded by a clear space the nature of which will be discussed later.

Fig. 1 shows a typical cytoplasmic inclusion. (Owing to the similar appearance of blue and red in a black and white photograph, it does not

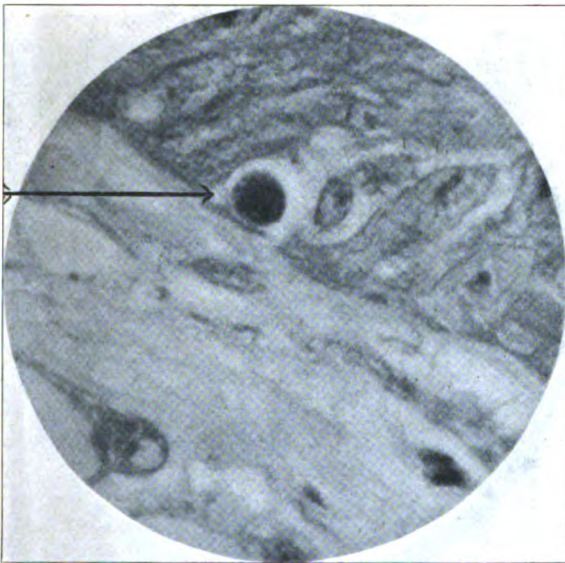


FIG. 3.—Granular eosinophilic inclusion. Intercellular. Stain eosin and methylene blue. ($\times 1400$.)

stand out so clearly as in the original preparation.) The cell is a typical prickle cell situated close to the basal layer of the epidermis. The cytoplasm is practically entirely replaced by an almost spherical eosinophil body. If this inclusion is examined more closely, it will be seen to be packed with small refractile bodies, and one is at once struck by the similarity between it and the Bollinger body of fowl-pox. Surrounding the nucleus is a clear zone; an appearance which becomes of some importance when other inclusions are examined. The nucleus itself is like none of the other nuclei in the field. The nucleolus is swollen and there is a curious collection of darkly staining chromatin arranged round the periphery of the nucleus. This change is of interest in association with Bedson's description of nuclear inclusions. This is, therefore, a cell whose nucleus shows changes which may or may not represent a mitotic

figure and which is surrounded by a clear zone and whose cytoplasm contains an eosinophilic body which strongly resembles the inclusion bodies of other conditions.

If one regards these inclusions as a colony of the virus, one would expect to find changes in the cell indicating an increase in the size of the inclusion. Such a change is well seen in fig. 2. Here there is a darkly staining, eosinophil inclusion in the cytoplasm of a cell of the basal layer of the epidermis. The granular appearance is not so well seen in this photograph. The nucleus is present at one pole of the cell and is very definitely crescent shaped, the indentation being due to the inclusion body in the cytoplasm.

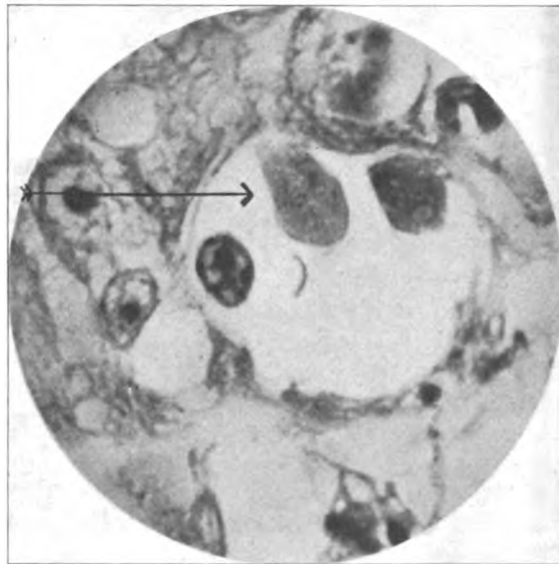


FIG. 4.—Cell nucleus and two granular inclusions in a cell space. Stain eosin and methylene blue. ($\times 1400$.)

These two examples, though they illustrate clearly the position of the inclusion body in the cell, do not represent the most common type. The more usual arrangement is that seen in fig. 3. This photograph shows the connective tissue core and the basal-cell layer of the epidermis. Here the inclusion body is surrounded by a clear space and it is difficult to determine its exact relationship to the cells of the basal layer which surround it. A nucleus, apparently "free," lies close to it.

This inclusion body is therefore either intracellular or of the same type as that shown in fig. 4. The presence of the nucleus suggests that it is of this latter type.

In fig. 4 two definitely granular inclusions are lying together with a nucleus, exhibiting changes similar to those noted in fig. 1, in a clear circular

space. The cytoplasm of the other cells in the field has a vacuolated appearance. This is significant in view of the statement by Ludford and Findlay (1926 [27]) who, in referring to the lesions of fowl-pox, state that "the earliest indication of infection of an epidermal cell is the formation of a small vacuole." As these changes described are taking place in or very close to the basal-cell layer, they cannot be degenerative changes associated with the formation of keratohyaline. Therefore it seems very likely that fig. 4 represents the end-result of a change which was seen commencing in fig. 1 and that the two inclusion bodies and the nucleus are lying in a clear space formed by the degeneration of the cytoplasm of the cell consequent on the infection. The circular shape of this space appearing in the paraffin



FIG. 5.—Intranuclear inclusion. Stain eosin and methylene blue. ($\times 1400$.)

section means that the nucleus and inclusions are probably within the remains of the cell. The refractile granules are very clearly shown in both of these inclusion bodies. One of the inclusions appears to have ruptured and the granules seem to be flowing out of it.

One other type of inclusion remains to be described. In fig. 5 there is an inclusion body surrounded by a clear space. The outer margin of this space stains blue (with eosin and methylene blue) and at one point there is a collection of blue staining material which appears to form part of the limiting ring. As the inclusion body and the surrounding substance are eosinophilic, the blue staining material is probably nuclear in origin. This at once suggests the first type of intranuclear inclusion described by Bedson. (An inclusion occupying the whole nucleus and separated from the nuclear

membrane by a clear space. The nuclear chromatin is arranged in irregular clumps round the periphery of the nucleus.) From lack of experience of this type of inclusion body no conclusion will be drawn from this, but the appearance is certainly very suggestive, more especially as the nucleoli of the other cells in the section show no tendency to take up the eosin.

In some of the sections the inclusion bodies stained irregularly with the blue stain. This type of staining has been noted in the inclusions of other conditions and forms another point of similarity. This staining reaction and the granular content, which has been demonstrated, help to differentiate between these inclusion bodies and the hyaline structures which Russell [28] described in cases of cancer.

(To be continued.)

A SIMPLE APPARATUS FOR THE DETERMINATION OF pH VALUES.

BY MAJOR S. ELLIOTT, O.B.E.,
(*From the Royal Army Medical College.*)

THE colorimetric method for the determination of the pH values of water, bacteriological media, body fluids, etc., has certain drawbacks apart from so-called salt and other errors, in that the colours of the standard tubes tend to fade, alkali may be dissolved from the glass and alter the values of the colours, and with deeply coloured or turbid fluids the colour matching is almost and sometimes quite impossible.

Most people get very alarmed at the mention of an electrometric apparatus for the measurement of pH values and imagine all kinds of complicated electrical apparatus is necessary, but in reality it is perfectly simple.

The apparatus to be described is very compact, can be made at home very easily by anyone who can use a soldering iron, and is rapid, accurate and simple to operate. It has the advantages that no colours alter, nothing goes wrong, and strongly coloured and even extremely turbid liquids present no difficulty. The apparatus in use at the Royal Army Medical College has "knocked about" the laboratory for years and still works well. Its only disadvantage is that it gives erratic results at pH values above 8·5, but as most fluids have a pH value below that figure, this disadvantage is of no importance.

COMPONENTS REQUIRED.

Millivoltmeter, 0-500 millivolts in divisions of 5 mv. or less (G.E.C.).

Rheostat, 200 ohms, obtained at any wireless shop.

Sensitive wireless earphones.

A switch made from a piece of springy brass, 2 by $\frac{3}{8}$ inch.

A brass brad and two tacks for the brass spring.

Copper or insulated bell wire.

Two specimen tubes, 1 by 3 inches.

A foot or two of glass tubing about $\frac{1}{8}$ inch bore.

Platinum wire about 6 inches, or gold electrodes (2), cost about 10s.

A small quantity of clean mercury.

Agar.

Potassium chloride, recryst. or A.R.

Acetic acid.

Caustic soda.

Quinhydrone, solid.

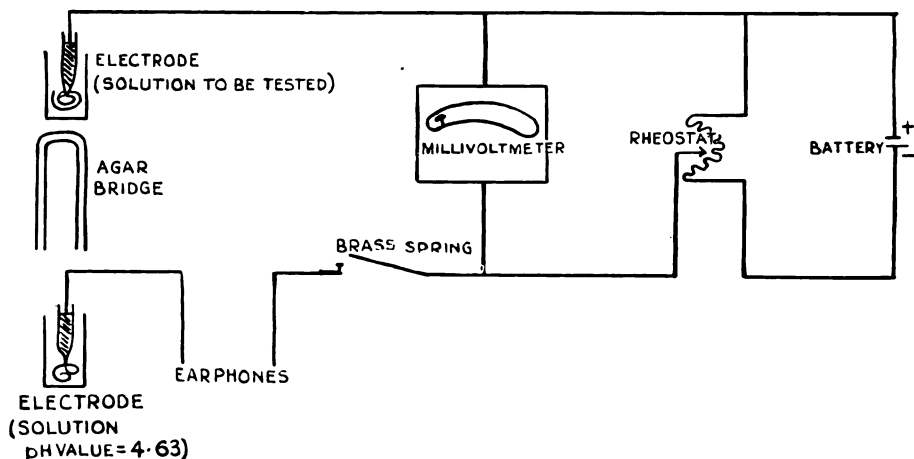
Paraffin wax.

Wireless battery or one cell of a car battery.

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MANUFACTURE OF COMPONENTS.

Mount the rheostat, millivoltmeter and brass spring with the brass brad under the raised end on a board, preferably waxed with paraffin wax and connect the wires as in the diagram, soldering all joints if possible, in order to obtain good and permanent electrical contact.



The Electrodes.—Cut a 6-inch length of glass tubing, heat the middle in a flame until soft, then pull it out gently. Break off near the two shoulders and seal half the length of platinum wire into each, leaving about $2\frac{1}{2}$ inches outside the tube. Then coil the outer part of the wire into a small spiral with a diameter of less than one inch, so that it may fit into the sample tube. Great care must be taken to see that the seal is sound and not cracked, otherwise mercury may get on the platinum and give false results. Fill each tube about three-quarters full of mercury and store in test tubes filled with distilled water. Gold electrodes can be bought and consist of a small square of thin gold fused on to a platinum wire; they are preferable to the platinum wire as more sensitive results can be obtained.

The Bridge.—Using a batswing burner, bend a piece of glass tubing about a foot long at about $4\frac{1}{2}$ inches from each end into a U shape. Dissolve $1\frac{1}{2}$ grammes of agar in 50 millilitres of distilled water, heated in a beaker over a burner. Saturate this solution with 20 grammes of potassium chloride and keep the beaker in hot water until all the air bubbles have risen. Warm the U tube over a flame and gently pour the melted agar and potassium chloride solution into the tube until both limbs are full. Put aside to set and then cut an inch or so off the end of each limb and store in a covered jar with the openings of the limbs under a saturated solution of potassium chloride. Although the bridge will last a long time if carefully washed in distilled water each time after use, it is advisable to make several at a time.

Standard Buffer Solution.—Normal solution of caustic soda and normal solution of acetic acid can easily be obtained from most laboratories. Using the same 50 millilitre pipette, transfer 100 millilitres of normal acetic acid into a 500 millilitre measuring flask, rinse out the pipette several times with distilled water and twice with normal soda, and then pipette 50 millilitres of the soda into the flask. Dilute to the mark with distilled water and store in a bottle coated internally with paraffin wax. The bottle should be fitted with a good glass stopper, as cork may yield impurities to the solution and affect its pH value. The pH value of this solution is 4.63.

METHOD OF USE.

In one sample tube place about $1\frac{1}{2}$ inches of the buffer solution and insert into it a platinum or gold electrode, and into the mercury place one of the wires of the earphones.

In the other sample tube place the liquid to be tested, filling to about the same depth, and insert into it the other electrode connected by wire to the millivoltmeter.

Add to each tube a knife point of quinhydrone and stir it in with the electrode in that tube. Some quinhydrone should be left undissolved.

Place one arm of the inverted U tube in each of the tubes under the surface of the liquids and press the springy brass strip on to the brass brad to make contact, meanwhile listening to the earphones. There should be heard a click as the spring makes contact with the brad. If not, then see that the wires are in the mercury, or that no wires are broken. A liquid with a pH value of 4.63 will fail to make a click also. Do not keep the switch closed longer than necessary as the electrodes will polarize and give a false result.

Connect the positive pole of the battery to the wire leading direct to the millivoltmeter and the negative pole to the wire leading to the brass switch and earphones.

On rotating the arm of the rheostat the millivoltmeter will register various voltages, and it is necessary to determine which of these will fail to allow a click in the earphones when the brass switch is pressed. If the fluid under test is more alkaline than pH 4.63 no position will be found, and it will be necessary to remove the wires from the mercury in the electrodes, cross them, and insert them in the opposite electrodes and continue the test. When the position has been found at which there is no click on closing the brass switch, note the reading on the millivoltmeter and take the temperature of the liquids in the sample tubes.

Ascertain from the graph corresponding to the temperature of the liquids the pH value of the liquid under test, using the portion of the line below 4.63, but if the wires have had to be crossed then use the line above 4.63.

To make the graph, plot millivolts along the base line of the squared

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paper up to 270 and mark pH values on the vertical line. On the latter line make a mark at 4.63. On the vertical line leading from 229.2 millivolts on the base line make two points, one at a point level with 0.63 on the pH value line and another at a point level with the 8.63 mark on the pH value line. Join these two points with the first mark at 4.63, and one has a V on its side.

If the millivoltmeter in the tests reads 80, then according to the graph there are two possible pH values of 3.2 and 6.0. If the wires were crossed the pH value was 6.0, if not crossed the pH value was 3.2.

If the temperature was 20°C. the figure employed, instead of 229.2, would be 230.8 as the former is the figure for 16°C. The rule is to add 0.4 for every degree above 16°C. and subtract the same amount for every degree below 16°C. The results are sufficiently accurate at ordinary temperatures for all practical purposes.

In order to check the accuracy of the apparatus, determine the pH value of a decinormal solution of hydrochloric acid: it should be 1.08.

If a liquid to be tested contains much protein, a pause of about five minutes should be made before taking a reading.

If mercury should happen to form a layer on the platinum or gold dissolve it off in concentrated nitric acid, washing the electrode thoroughly in water afterwards.

If a sensitive galvanometer or millivoltmeter can be obtained it is more convenient in use than earphones.

The cost of the whole apparatus should be below £3.

INFLUENZA AND APPENDICITIS,

BY MAJOR F. T. BOUCHER,
Royal Army Medical Corps (T.C.).

IN order to forestall criticism, let me state at the beginning that I have no conclusive evidence with which to prove the theory that I am about to expound.

I believe it to be true, but my aim is not to convince anyone but to indicate a path—shadowy and indefinite as it may well be thought—a path along which much useful research might be done. Influenza and appendicitis are the twin curses of modern life, whether civilian or military, and I am convinced that they are closely related. If a prophylactic for either could be found then I believe that *both* would disappear and trouble us no more. I was first drawn to thinking that there might be some connexion between the two some ten years ago and time has made stronger the feeling that there is a connexion and a very close connexion too.

The way in which my investigations started was this: I am by way of being an anæsthetist. I like giving anæsthetics and I have given a large number not only in the Army but outside as well. I noticed first of all that operations for appendicitis were three or four times as numerous during the winter months (especially January, February and March) as they were during the summer months. This struck me as curious, as after all I know no reason why inflammation of the appendix should be more likely to occur during bad weather than in good. Appendicitis is supposed to be due in 98 per cent of cases to what is called in motor parlance mechanical breakdown, one result of which is inflammatory changes in the appendix. The next thing I noticed was the incidence of post-operative "chest." At one time it became alarming and case after case developed an anæsthetic "chest."

This worried me very much and, being naturally of a diffident nature, at first I thought that the fault must lie with me and the technique I used in the administration of the anæsthetic. It is my routine practice to use open ether after preliminary induction with ethyl chloride. Working on the basis that the fault lay with the anæsthetist I tried giving all sorts of anæsthetics—chloroform, ether with the Shipway apparatus, ether in a Clover, spinal anæsthesia and the barbiturate group of basal anæsthetics.

The results were no better and I came to the conclusion that the fault did not rest with me. This was comforting but did not help in the solution of the problem.

I then consulted the surgeons at the general hospitals in Birmingham and asked them if they were troubled in the same way as I was. I gathered

that post-operative " chests " were common after operations in the upper abdomen but that they had not noticed any undue number in appendicectomies.

I then consulted several surgical specialists in military hospitals and found that their experience marched with mine and that post-operative chests were much too frequent after appendicectomies. This was a puzzle. Why should patients in military hospitals get " chests " while in civilian hospitals " chests " after appendicectomies were practically unknown? I scouted the idea that the technique in civil hospitals was better than in military ones. I have extensive experience of both and should say the standard was fifty-fifty. I racked my brains for a long time and finally hit on what I believe to be the true solution.

It is unusual, I think I may say, for an early appendix to be admitted to a general hospital; they are left outside much too long and when they are admitted, gangrene and perforation are the rule rather than the exception.

This is certainly not so in a military station. As soon as a man gets a pain in his stomach he rushes off to the medical officer at once and the diagnosis is made at the earliest possible moment. It is, if not rare, at least unusual to see a gangrenous appendix in a military hospital and I trust it always will be. It follows then that operation for early appendicitis is the rule in military hospitals and the exception in civil ones. Was this, I thought, anything to do with my problem? I looked up the records of fifty cases and found that the " chests " occurred in cases which had been diagnosed as early appendicitis and operation had shown that there was slight inflammation present. In those cases where the condition, for one reason or another, had been neglected, and consequently severe damage to the appendix and peritoneum had occurred, no record of a single post-operative " chest " could I find. It would seem, therefore, that early operation for appendicitis results in the patient getting a " chest " while late operation does not. This is, of course, absurd in that there is no reason for it and if it is true, then the only explanation is that the diagnosis of appendicitis is very often wrong.

It is well known that abdominal symptoms are very common in acute diseases of the respiratory tract. When I was a student I remember very well a case of a boy of 18 who had had his appendix removed two months before. He was brought up to Casualty complaining of acute abdominal pain. He had fever, acute pain and rigidity in the right iliac fossa, constipation and vomiting; in other words he had all the physical signs of acute appendicitis. I am quite sure that if he had not had the scar of his operation he would have been put on the table straight away. As it was he was admitted to hospital and developed an acute lobar pneumonia the next day. I have never forgotten the case and it has taught me always to put a stethoscope on the chest before definitely making a diagnosis of appendicitis.

There is no doubt also that gastric influenza is a clinical entity. Quite 50 per cent of influenza cases have abdominal symptoms. It is not surprising that it should be so ; my knowledge of histology is somewhat rusty but I fancy that both the appendix and the nasopharynx are largely made up of lymphoid tissue. We know that the habitat of the *B. influenza* is the lymphoid tissue of the nasopharynx, and this being so I can see no reason why it cannot also cause inflammatory changes in the appendix.

If it does then these cases of appendicitis which are operated upon and which afterwards develop " chests " are not truly cases of appendicitis at all but are really symptoms of respiratory diseases. If this is so it is readily understandable why they develop " chests " after an anæsthetic. Operation is therefore contra-indicated and I am of opinion that a case diagnosed as appendicitis during an influenza epidemic should be given expectant treatment only and not hurried off to the operating theatre.

It is an interesting coincidence that I do not remember a case of influenza in a patient who had had his appendix removed previously. In my own case I went down regularly with influenza every Spring until 1912 when I was unfortunate enough to get a perforated appendix with general peritonitis. I have never had influenza since, although in the Spanish influenza epidemic of 1918 I had a hospital full of it. It seems to me that a person who has had his tonsils out and his appendix removed should be immune to the disease. By influenza of course I mean the real influenza, not the ordinary common cold which is dignified by the general practitioner in order to please his patient as suppressed influenza, influenzal cold or the usual mild attack of 'flu.

As I stated at the beginning I do not insist on the accuracy of my deductions but I think that the reasoning is sound logic. I believe that there is such a thing as influenzal appendicitis and that operation for such a condition is bad treatment. This article is not in any way meant to be provocative but is intended merely as a humble step towards the solution of a problem which is a serious menace to the well-being and efficiency of the British Army.

LETTERS FROM THE PENINSULA.

WRITTEN IN 1811 BY CAPTAIN CRANSTOUN GEORGE RIDOUT,
11TH LIGHT DRAGOONS.

SELECTED AND EDITED BY HIS GRAND-DAUGHTER, MRS. BLACK-HAWKINS.

I MUST introduce the following extracts by saying that they are taken from letters written by my Grandfather, Captain Cranstoun George Ridout, 11th Light Dragoons (and subsequently 2nd Life Guards), to his father during the Peninsula Campaign. The letters date from May, 1811, to March, 1813, and the centenary of the battle of El Boden occurring in 1911, it was thought that extracts containing a personal narrative of that affair might be of some interest at the present time.

Captain Ridout was born in 1785, and entered the Army in 1801 at the age of sixteen. He lived to be nearly ninety-six, dying at Brighton in 1881. In 1811 the 11th Light Dragoons were ordered to the Peninsula on active service and my Grandfather, at that time Aide-de-Camp to his Uncle, General Sir John Floyd, then Commander of the Forces in Ireland, rejoined his regiment and set sail for Lisbon in the transport "Mercury" from Plymouth, on May 13. The Fleet, of which the "Mercury" formed a part, consisted of thirty-two sail of transports, under convoy of a sloop of war (the "Favourite") and a large Man-of-war brig. Adverse winds and calms had so delayed both the start and progress of the Fleet that it was nearly a month after embarkation before the regiment arrived at Lisbon, on May 27. So urgent was the call from Lord Wellington for reinforcements that the 11th Light Dragoons were ordered to march to the seat of war at Badajoz immediately on disembarkation. Pushing on with all speed and not allowed to halt for even a single day, they arrived at the Camp of Elvas on June 17, and June 22 "was the first day of the operations of the old Eleventh in the field," in an action fought in front of Badajoz. Passing, however, over all intermediate letters, the following, dated October 4, is selected.

Celerico, October 4th, 1811.

"My last letter from Castelleja da Azava, a small village on the river Azava and distant from the fortress of Ciudad Rodrigo about four leagues, apprised you of the movements of the enemy and of the approach of Marshall Marmont with a very considerable force and large convoy of provisions for the relief of that important fortress.

"Five Divisions of the British Army, with four Brigades of Dragoons and Hussars (including the 11th Light Dragoons and 1st German Hussars), were assembled on the Aqueda about the 18th of September, with a view of intercepting the convoy known to be on the road from Salamanca under the escort of 25,000 Infantry and Cavalry. It had been the intention of

Lord Wellington in the first instance to have disputed the entry of this convoy into Rodrigo, the which we could have managed with perfect ease, and in all probability to the destruction of the entire. But on the 20th information was received by the Commander of the Forces of the rapid advance of Marshall Marmont, and that, too, with a force so superior, said to be 50,000 men, from Placentia, &c., as to render it imprudent for the British to cross the Aqueda for the purpose I have stated. Two more Divisions of the Army were now brought up, and the whole were assembled in the different villages and 'Bevouaicks' (olive groves) within a few miles of Ciudad Rodrigo, and ready to be brought into the Field at the shortest notice. Never, I will venture to state, was an army in higher order than that of Lord Wellington, or composed of men more determined to do their duty than the brave and gallant fellows now collected together near the plains of Rodrigo.

"M. General Baron Alten's Brigade, the 11th Light Dragoons and 1st German Hussars, occupied a Bevouaick near El Boden, from whence picquets were detached and sent to occupy a chain of hills within a short distance of the Fortress. The Videttes were stationed about half a mile from the bridge, by which means no person could leave Rodrigo without being seen. Lord Wellington's quarters were at Fuentes Guinaldo, a small village between El Boden and Castelleja, the which was about the centre of the British Army. Here a work had been thrown up, mounting twelve nine-pounders, upon which the enemy could not advance without incurring a very considerable loss.

"Such was the position of the force under the personal command of Lord Wellington, when, on the evening of the 23rd of September, the first division of the Convoy hove in sight on the road from Salamanca, under escort of three Regiments of Dragoons and 5,000 Infantry. The following morning and indeed during the greater part of the day, the enemy were employed in securing the entry of the remainder of the convoy into the Fortress, and by four in the afternoon the whole had safely arrived; and that without having experienced any interruption whatever on the part of the British.

"Lord Wellington had attentively watched the operations of the Enemy in the course of this and the preceding day, from a hill commanding a perfect view of the Fortress and country in its immediate neighbourhood, and was fully satisfied of the intentions of his adversary to bring him to a general and decisive action, as soon as he, Marmont, should have collected the whole of his Force, then hourly arriving.

"In the course of the afternoon, twenty-five Battalions of Infantry, amounting to 22,000 men, and 5,000 Dragoons and Hussars were drawn out on the Plains in front of Ciudad Rodrigo, and from their movements it was evident that something was intended for the following morning. Orders were issued for the troops to be ready an hour before daylight, and the 5th Division to be under arms in the rear of El Boden. An order

was given for the horses to be fed at one o'clock, and the Brigade (the 11th Light Dragoons and 1st German Hussars) to be ready to move from the Bevouaick by three, so as to be at the alarm post in rear of El Boden by the time appointed by the Commander of the Forces.

"On the arrival of the 11th and 1st German Hussars at El Boden, the whole of the 5th Division (General Picton's) was already formed on the ground, standing in a close column of Companies by Brigades. As soon as it was daylight the 11th Dragoons and 1st German Hussars, with one Brigade of the 5th Division under the command of the Honourable Major General Colville, consisting of the 2nd Battalion 5th Regiment, 1st Battalion 77th, 1st of the 83rd and 21st Portuguese, with four nine-pounders (Portuguese), passed through El Boden and took up a position on the Plain fronting Ciudad Rodrigo. There the troops dismounted and were directed to wait for further orders. All was quiet till about eight o'clock, when distant firing was heard in the direction of Ciudad Rodrigo, as well as towards Espega, where was the 1st Division of the Army under General Graham, and the Brigade under General Anson consisting of the 14th and 16th Light Dragoons.

"Several officers immediately mounted and rode some distance to the front, where were posted two Hussars for the purpose of watching the road leading from the Fortress towards Guinaldo. By the help of our glasses we could plainly discover that our picquets near Rodrigo were attacked, as well as those of the 14th and 16th Light Dragoons on our left; and that the Enemy with a very considerable superiority were driving them back, the 11th and Hussars on El Boden, and the 14th and 16th on Espega. About nine o'clock the Enemy's cavalry were seen to leave Rodrigo, and with them a considerable force of Infantry and Artillery; the whole forming on the Plain, and advanced towards Fuentes Guinaldo.

"Lord Wellington was not at first satisfied as to their intention and in consequence it appears that the support we otherwise should have had did not arrive in time to afford us the smallest assistance. Lord Wellington, being now, 11 a.m., fully convinced of the purpose of the Enemy, directed a fresh position to be taken up, and where the attacks from the Enemy's numerous Cavalry were least likely to take effect on the handful of British troops then about to be brought into action; the force then advanced against them, being not less than from 18,000 to 20,000 men. It is necessary that I should state the exact situation at this moment, and the nature of the ground which was shortly to become the scene of obstinate and tremendous conflict, for so it ultimately proved to be to many a brave and gallant soldier on either side.

"The village of El Boden stands on a tract of high open ground fronting Ciudad Rodrigo from which it is distant about eight miles. The plain between Rodrigo and El Boden is very extensive and capable of drawing up 200,000 men if it were necessary. The ground, however, is in many places swampy and very considerably lower than that leading to Fuentes

Guinaldo or Espeja, the former being the centre as well as the then Headquarters of the army. The British Infantry, composed of the regiments I have already named, was formed in the following order, and awaited in silence the enemy's approach. On the right of the line was the 83rd Regiment, between which and the 2nd Battalion of the 5th Regiment was a deep ravine; on the left of the 5th were four nine-pounders (Portuguese), then the 21st Portuguese, and then the 1st Battalion 77th.

"In rear of the Infantry and at the distance of 150 yards was General Alten's Brigade (11th Light Dragoons and 1st German Hussars), (from which three squadrons were detached under the orders of General Crauford), the whole then present owing to sickness, etc., not amounting to more than 350 Hussars and Dragoons. The ground immediately in our front occupied a distance of four hundred yards; it was here terminated by the brow of a steep hill, up which the Enemy were obliged to advance ere they could come in contact with the British troops anxiously awaiting their arrival on the Plain. From the brow to the foot of the hill was about two hundred yards, and difficult of ascent, ending with a ravine which also led to a rising ground, where the Enemy placed its nine-pounders commanding the ground occupied by the British.

"A few minutes before 12 o'clock the Enemy's Cavalry, consisting of forty Squadrons of Hussars, Chasseurs, Dragoons and Imperial Guards, amounting to 3,000 men, had arrived at the foot of the hill where they were sharply and vigorously opposed for a short time by our skirmishers and the Riflemen of the Infantry, who however were ultimately compelled by reason of overwhelming numbers to fall back on their respective corps.

"The whole line was now ready to receive the Enemy, whose squadrons by this time, 12 o'clock, had gained the heights. Instantly our guns opened a heavy fire of round shot as they advanced to the charge, which from the numbers was almost irresistible. The Enemy in the most gallant and determined manner rode up to the very mouths of the guns, and actually cut down the artillery men in the moment of pointing them afresh. They were as instantly driven from them by well-directed fire from the 2nd Battalion of the 5th Regiment, and the guns were again in our possession. Another line of Hussars and Dragoons now rushed forward, and in the same resolute manner dashed up to the very bayonets of the 77th Regiment, who received them in the most undaunted style that could possibly be conceived. A most tremendous fire was that instant opened upon them by the 77th and 21st Portuguese Regiments, when they fled with the utmost precipitation, leaving the ground strewed with their dead and wounded. While this was going forward on the right, another large body of Cavalry arrived on the Plain, fronting the 11th Light Dragoons and German Hussars. An immediate order was given to attack those which had already been repulsed by the fire of the Infantry, as well as the fresh line of Cavalry then advancing. The 11th Hussars dashed forward at the moment, and never was a grander and finer sight than then presented

itself. Hundreds of the Enemy's Horse straining every nerve, and using every exertion to escape the fury of a handful of British Dragoons. Our horses being fleetier than theirs, we soon came up with them, and many a Hussar was reluctantly compelled to bite the dust. They now gained the brow of the hill, down which they hastily retreated, and that after having sustained considerable loss. To have followed them would have been most dangerous, most imprudent; as 13,000 Infantry and twelve pieces of nine-pounders were rapidly advancing to their aid. Lord Wellington, seeing the approach of so large a force, and of its being impossible to hold the ground then in possession of the British with such inferior numbers without the risk of losing many very valuable lives, gave orders for the Infantry to fall back on Fuentes Guinaldo, previously sending for two Brigades of Heavy Dragoons to the support of the 11th, and German Hussars (General Alten's Brigade).

"The Enemy now opened a heavy and destructive fire from six pieces of cannon and having recovered a something from their late shock, again advanced on the plain, and were as immediately charged and driven with slaughter down the hill by the 1st German Hussars and 11th Light Dragoons. The fire from their guns was tremendous, and shot and shells flew about so thick that a looker-on would have supposed that not a man of the few then remaining would have had it in his power to quit the field alive. The Enemy now appeared resolute in carrying all before them, and came rushing on like a torrent. They were, if possible, more gallantly received by the 11th and the Hussars (now left entirely alone) than before, and as before, flew like lightning from their swords down the hill, each time leaving the ground covered with their dead. Six successive charges had taken place when my horse was struck by a shot and killed, and I ran considerable risk of being either killed or taken prisoner. I instantly mounted another, and in time for a charge then ordered. The Brigade, by these repeated attacks against numbers so extremely disproportionate, exposed at the same time to the continual fire of six nine-pounders, had suffered considerable loss in men and horses, and several officers had been compelled to withdraw from the field severely wounded.

"The horse I now rode was wounded, having been struck by a musket ball in his back, as were also many of the horses of the Dragoons and Hussars.

"The French Infantry had now arrived to the support of their shattered and confused Cavalry, which rendered further opposition on our part totally impracticable without running the risk of losing the whole of the few Dragoons and Hussars now remaining. The tenth and last charge had been made when Lord Wellington sent orders to Baron Alten to retreat on the Infantry who had by this time fallen back about two miles on the plain.

"The Brigade (11th and 1st) immediately went about, the which was no sooner perceived by General Mont Brune (the Commander of Marmont's

Cavalry), than the whole of his cavalry rushed forward and we were compelled to trust to the speed and bottom of our horses to escape in turn from their fury. So intent were they on our destruction that they were not aware of the danger to which we were leading them, near to the Infantry now formed into a square, who immediately opened a most tremendous fire of musketry and round shot from our six-pounders, which mowed the French down in grandest style, and they fled in the utmost confusion and dismay, leaving the ground covered with their unfortunate comrades dead and dying, and horses running off in all directions rendered sad spectacles from the effect of our cannon and musketry shot.

“Though they never attempted again to close with us, the whole line of Infantry and Cavalry followed us for six miles over the Plain, continually throwing into our ranks shot and shells by which many brave men both of the Infantry and Cavalry lost their lives.

“About 4 p.m. the Enemy halted and their artillery ceased to play on the British. Shortly after, the whole of their Cavalry dismounted and with their Infantry began to cook. The Commander of the Forces now rode up to the 11th Light Dragoons and 1st German Hussars, and stated that he had with peculiar satisfaction witnessed their gallant and heroic conduct, and begged all would accept his warmest thanks, and assured them he would not fail to report his sense of their conduct to those by whom he trusted it would be duly appreciated and recollected.

“Here closed the fighting of this eventful day but although we did not leave our horses till eleven o'clock that night, we were in the field again by three in the following morning, where by daybreak we found drawn up on our front 66,000 Infantry, 7,000 Dragoons and 125 pieces of cannon.

“But to go back :—

“The French Cavalry having, as I said, dismounted and with their Infantry commenced preparing to Bevouaick for the night, General Alten's Brigade (11th Light Dragoons and 1st German Hussars) in like manner dismounted, while the 3rd Division under Sir Thomas Picton continued its retreat on Fuentes Guinaldo, and there falling into the position of the Army, halted. While the 11th Dragoons and 1st Hussars were waiting for orders from Sir Stapleton Cotton, Commander of the Cavalry, he made his appearance at the head of two Brigades of Heavy Cavalry, General Slade's and de Grey's, with the addition of two troops of Horse Artillery.

“Had we been fortunate enough to receive this support two hours earlier in the day, or had they been up, the French Cavalry would have sustained a very severe loss ere their infantry could have borne a part. As it was, their loss was very considerable owing to the well-directed fire of our six-pounders and the admirable steadiness of the British troops, cavalry as well as infantry. Sir Stapleton Cotton having observed the situation of the Enemy and being satisfied that nothing further was intended on their part, at least for a few hours, gave orders for the removal of Baron Alten's Brigade to the rear, for the purpose of feeding and watering the horses and

refreshing the men as far as circumstances would admit of. In consequence of this order, Major General de Grey's Brigade, consisting of the 3rd Dragoon Guards and 4th Dragoons, marched to the front and relieved the out-posts and videttes of the 11th Light Dragoons and 1st Hussars, when both regiments retired on Fuentes Guinaldo, distant about three English miles.

"On their arrival at Fuentes, a return was called for, by the Commander of the Forces, of the casualties of each Corps, which most unfortunately proved to be of considerable extent, numbers of fine fellows having been killed or wounded (as well as a large proportion of horses), and those that remained were completely jaded from the great fatigue they had encountered, and having been seventeen hours without food. It was now getting dark and the Brigade had mounted for the purpose of returning to the Field and resuming its situation at the out-posts, when an unexpected order was received by our General from Sir Stapleton Cotton, by which we were directed to proceed to Castelleja da Azava, there to pass the night and to be on the ground in front of Fuentes Guinaldo an hour before day dawn.

(To be continued.)

Editorial.

ON THE STATE OF THE PUBLIC HEALTH.

IN the introduction to his Annual Report Sir Arthur MacNalty points out that the new and wider interpretation of preventive medicine, about which Sir John Simon wrote forty-five years ago, has assumed a still wider interpretation. The dividing line between preventive and curative medicine grows fainter and fainter, and in many instances has disappeared.

For a time the practical application of measures for protecting the health of the people brought about an artificial cleavage between Preventive and Curative Medicine. The Medical Officer of Health was regarded as a somewhat narrow specialist, and even at times as unsympathetic to the claims of clinical medicine. This attitude was unfortunate, but is fast disappearing. The advances in public health made during the reign of King George V have gradually brought all agencies for promoting national health into closer and more helpful concord.

The estimated mid-year population in 1935 of England and Wales was 40,645,000. The change in the age constitution to which reference has been made in previous reports has continued, and it seems probable that it will continue, and the striking increase in the middle-age and old-age groups will necessitate a gradual change in the provision for social services. There will be a regrouping of health services and a re-allocation of expenditure according to altered needs.

The number of births registered was 598,756, representing a birth-rate of 14·7. This is a fall of 0·1 from 1934, but is 0·3 above the rate of 1933, which was the lowest recorded. The infant mortality fell from 59 to 57, the lowest on record. The death-rate was 11·7 compared with 11·8 in 1934.

The principal causes of death were : Diseases of the heart and circulation ; cancer ; bronchitis ; diseases of the nervous system ; all forms of tuberculosis. If the diseases are set out in order of magnitude for the age-period 15 to 65, man's working life, all forms of tuberculosis take the third place, then follow bronchitis and diseases of the nervous system. Sir Arthur MacNalty writes, " Nothing is more remarkable than the decrease in infant mortality in the last thirty years, and, as was noted in 1933, no spectacular improvement can now be anticipated. The lower the rate, the nearer one approaches the irreducible minimum."

In the third section of the Report reference is made to recent studies in experimental epidemiology by Topley, Greenwood, Bradford Hill, and Joyce Wilson. In an Editorial in the October number of this *Journal*, 1936, we gave a précis of the results obtained by these workers during their studies of groups of mice.

The most interesting were the effects of immunization in bacterial

diseases due to *B. aertrycke*, mouse typhoid, when contrasted with those in the virus disease ectromelia. In the bacterial diseases an advantage was conferred, but immunization, even when none but immunized immigrants were admitted to the herd, did not control the infective process. The authors write: "Given transient or intermittent exposure to infection there seems good reason to expect that the immunity induced will reduce the incidence of the disease to relatively small proportions. Even if the exposure to risk is severe and continuous the vaccinated will on the whole fare slightly better than the non-vaccinated. There would, on the other hand, seem to be no justification for the view that in the vaccines at present available we have an instrument that will afford protection against all probable risks and will so allow us to disregard or relax our measures of general hygiene."

The results obtained by immunizing mice against the virus disease were very different. By vaccination it is possible to give the new entrants nearly complete protection and to place them in as favourable a position as survivors from infection. In the present position of our knowledge respecting the biology of influenza and the impossibility of controlling this disease by ordinary hygienic measures the suggestiveness of these results is clear. Their relevance to the hopeful prophylactic results obtained in measles is also clear.

Dr. V. D. Allison and Dr. W. A. Brown have continued their investigations on reinfection as the cause of complications in hospitalized cases of scarlet fever. From the evidence obtained it is concluded: (1) That complications occurring during the first week are probably due to the primary infecting type of *Streptococcus pyogenes*; (2) complications arising during the second week may be due to the primary infecting type or to infection with another serological type; (3) complications arising after the second week are much the most common and are due to infection with another serological type.

The study of scarlet fever patients nursed in cubicles has shown that only one serological type of *Str. pyogenes*, the primary infecting type, is found throughout the course of the disease. If complications occur, they appear early and are associated with the original type. An outbreak of scarlet fever conveyed by a single milk supply and uniform in its type provided confirmation of this observation. The outbreak was caused by *Str. pyogenes* Type 1 which was isolated from all the twenty-three patients examined. Eight of these patients were in one ward which contained no other patients; swabs were taken weekly from admission until discharge. No change of type occurred, the same Type 1 being found throughout, and there were no complications.

In a further study of ward infections Dr. Allison and Dr. Brown exposed blood-agar plates in three scarlet fever wards to ascertain the distribution of *Str. pyogenes* through the air. Six corresponding sites in

each ward were chosen and the plates were exposed during three periods in the twenty-four hours: (1) From 12.30 to 3.30 a.m. when all the patients were asleep and only the night nurse was on duty; (2) 7.30 to 10.30 a.m. when work in the wards was going on; (3) 1.30 to 4.30 p.m. when convalescent patients were up and playing in the wards. A large number of streptococcus colonies were isolated indicating a considerable degree of aerial contamination. There was a striking contrast between the number of colonies found on the plates exposed at night and those exposed in the morning and afternoon. Of the 286 colonies found, 2 were on the plates exposed at night, 158 on the morning plates, and 126 on the afternoon plates. When these colonies were typed it was found that Types 1, 2 and 4, the prevalent epidemic types, accounted for 209 of the colonies. All the 6 serological types found are known as the cause of scarlet fever.

These observations show that aerial contamination is of great importance, but the significance of the findings has yet to be assessed and further points are being investigated.

Cruickshank has shown that air as a vehicle of contamination by *Str. pyogenes* is of great importance in the case of open wounds. He has found that frequently septic infection of severe burns is due to *Str. pyogenes*, that the infection occurs in the majority of cases after admission to hospital, and that numerous hæmolytic streptococci may be isolated by exposure of blood-agar plates to the air and dust of the "burns ward." Some of the strains thus isolated were typed in the Ministry's Laboratory and it was found that strains isolated from eight cases of burns admitted over a period of three weeks all belonged to one serological type (Type 4). In another case Type 23 was isolated from the atmosphere of the ward and from a case of burns in the ward at the same time.

Sir Arthur MacNalty points out that while the study of the epidemiology of the common infectious diseases is hedged round with innumerable difficulties, such as the shifting population, very large number of contacts, the removal of cases to hospital, etc., a rich source of information remains untapped in isolated rural areas of England. Dr. W. N. Pickles has studied the epidemiology of Wensleydale for many years. The population at risk is small in number, distributed in small farms, and of fixed habits. In these circumstances Dr. Pickles claims that "practically every case of infectious disease can be traced to its source and such matters as methods of spread, incubation period, duration of infectivity, and role of carriers at least can be studied to best advantage."

Sir Arthur MacNalty says that perhaps the most interesting outcome of these investigations is the evidence that Dr. Pickles adduces in support of the view that the incubation periods of the common infectious diseases are constant within very narrow limits, instead of being widely variable as is usually taught. Thus the incubation period for measles would appear to

be, not seven to eighteen days, but exactly twelve days, other supposed periods being due to misleading history.

In 1935 the principal infectious diseases showed no unusual or disquieting features. Epidemics of measles recur at intervals; usually there is a double curve of epidemicity, one peak occurring in alternate Junes and the other in alternate Decembers. In London the two peaks coincide and result in a single wave at intervals of a hundred and four weeks. The fatality rate does not always coincide with high incidence. The explanation is that measles by itself is rarely a fatal disease, and peaks of mortality depend on a synchronism of two periodic waves of virulence, one due to the measles virus and the other to the streptococcus or other secondary invading organism.

In 1758 Home attempted the inoculation of measles in the hope of producing a mild attack with consequent protection through later life. His procedure has been followed by Michael Von Katona in Hungary, and Thomson in Glasgow. French and Japanese workers have endeavoured to produce immunity by repeated injection of diluted blood from measles patients. All these procedures are now abandoned. Attempts have been made to manufacture protective sera in the sheep, goat and the horse, but extensive trial has shown these sera to be without value.

In 1916 Nicolle and Conseil employed serum from convalescent patients in the prophylaxis of measles. The efficacy of measles convalescent serum and adult serum in the prevention or amelioration of an attack has now been proved beyond doubt by an investigation carried out in the London County Council hospitals during the measles epidemics of 1901-02 and 1933-34. In order to insure prevention, the investigation showed it was desirable to administer serum within six days from the earliest exposure. For the purpose of securing attenuation it was found to be important to inject one-half the standard dose within six days of exposure rather than the full dose at a later period. A dose of 10 c.c. of adult serum is more successful in procuring protection than one-half that amount, and a flat dose of 10 c.c. is as effective as an age-adjusted dose. The clinical results suggested that the shorter the bleeding interval after the attack in respect of donors the more potent the resultant serum is likely to be: serum with an interval under ten years from the measles attack in the donor returned a protection rate of 100 per cent.

Sir Arthur MacNalty writes that in the control of measles in hospitals and institutions it is more economical to aim at complete protection and abolish the disease in the wards. The immunity does not last more than two or three weeks. In other circumstances it may be advisable to secure a mild attack followed by an immunity which is usually permanent. The private practitioner may therefore find it expedient to make his choice of procedure on the following lines: (1) Complete protection for contacts—(a) under three years if the physical condition is not good; (b) of all ages who are weakly or debilitated and those who are suffering from an inter-

current disease; (2) attenuation after the age of three years if the physical condition is satisfactory. The injection should be given intramuscularly, preferably in the vastus externus muscle.

In 1935 there were 120,456 notifications of scarlet fever with 573 deaths. A survey of the incidence of scarlet fever in the last quarter of a century reveals marked fluctuations in the annual incidence and emphasizes the comparative failure of the methods used to control the disease. The failure of hospital isolation to control the spread of scarlet fever has been admitted for years, and it is stated that a large proportion of the patients are now removed to hospital on social grounds rather than for purposes of prevention.

Scarlet fever in its clinical form of a febrile disease with a punctate erythematous rash is now regarded as a manifestation of a hæmolytic streptococcus in a person who is susceptible to the toxin manufactured by it. The erythrogenic capacity of streptococcal strains varies considerably; in some it is so high that 90 per cent of the persons infected develop clinical scarlet fever; in others it is so low that only one in ten or twenty develops the characteristic rash. Bearing these facts in mind it is easy to understand why hospital isolation has failed to control the disease.

Medical practitioners are becoming alive to the protean manifestations of infection with the hæmolytic streptococcus; but Sir Arthur MacNalty considers that there is need for the education of the general public as to the infectious nature of tonsillitis and feverish sore throat unaccompanied by a rash.

It is not uncommon for cases of scarlet fever to occur in houses from which a notified case of scarlet fever has been removed. If the case occurs within a week it is probably due to infection from the original case; if it occurs from eight to twenty-eight days after the primary it is probable that another member of the household, immune to the toxin, was infected by the primary case and has become a carrier and served as an intermediary between the primary and the late secondary case.

Return cases have been a source of great anxiety to superintendents of hospitals, who have advised that convalescent cases should be kept away from susceptible children for two weeks, as it is impossible to guarantee them free from infection. The work in the Ministry's pathological laboratory suggests that the accidental reinfection with another strain (i.e. a type different from that responsible for his illness) of the convalescent while in hospital is commonly the reason why he gives rise to a return case after he goes home.

The evidence seems to indicate that patients should be warded in accordance with their types, or each patient should have his own cubicle. Neither of these remedies is stated to be at present practicable. The only practicable alternative is to treat scarlet fever patients at home, and this policy has been advocated for some years.

In 1935, 65,084 cases of diphtheria were notified as compared with 68,759 in 1934, and 47,435 in 1933. Facilities for artificial immunization against this disease are now available in approximately two-thirds of the County Boroughs and in the majority of the Metropolitan Boroughs, as well as in many smaller sanitary districts. The Report on Immunization of a Committee of the British Medical Association issued in July, 1935, stated: "We consider that the reagents and the technique have reached such a stage and the result of their application has been so successful that there is a strong case for the universal adoption of immunization." The Ministry's memorandum on the production of artificial immunity against diphtheria issued in 1932 did not prescribe a particular course, regarding this as a matter for personal selection by the medical officer concerned.

A Departmental Committee appointed by the Medical Officer of Health of the London County Council has drawn attention to the growing tendency for children who show no clinical manifestations of the disease to be notified as suffering from diphtheria on the strength of bacteriological findings. The Ministry strongly emphasize that swabbing is not a substitute for clinical observation, but merely an auxiliary.

Whooping-cough is notifiable in thirty-six sanitary districts in England and Wales. The disease is an important cause of child mortality. Many trials have been made to prepare a preventive vaccine. So far vaccines have not proved helpful in the treatment of the disease. The work of Sauer, Frawley and others shows that a suitable vaccine can confer immunity, but it is not established for four months. Nearly half the cases occur in the first two years of life: to be effective, immunization, owing to its slow maturity of protection, would have to be performed early in infancy.

The notifications of cerebrospinal fever continue to decrease. During the twelve months from April 1, 1935, to March 31, 1936, meningococci from 89 cases of cerebrospinal fever were examined in the Ministry's laboratory: of these 47 per cent belonged to Group I and 53 per cent to Group II. The slight preponderance of Group II is thought to be characteristic of a period of diminishing epidemic prevalence of the disease. One institute has undertaken the preparation of a special Group II therapeutic serum for the treatment of sporadic meningococcal meningitis, which occurs in small children and is commonly due to infection with Group II. The last annual report of the Chief Medical Officer drew attention to the danger of "serous meningitis" if the administration of anti-meningococcus serum is continued longer than necessary. Dr. Kennedy, of the Lodge Moor Hospital, Sheffield, states that he stops the injections after obtaining three consecutive sterile fluids; he believes more harm than good is done by continued drainage of the cerebrospinal fluid and intrathecal injection of serum.

There was a slight rise in the incidence of poliomyelitis in 1935, but it is considered of no particular significance, and the distribution showed its customary uniformity. A feature of outbreaks in Denmark and California has been the relatively high incidence among adults. It is now recognized that the majority of children have been immunized by mild infections, for the most part symptomless. Infection, therefore, may be "silent," and the first manifestation may be a paralysis which proves rapidly fatal.

Two vaccines have been used in America: one, Kolmer's, is a living vaccine attenuated by sodium resin oleate, the other, Brodie's, is a virus killed with formalin. Brodie's vaccine is safe, but doubts exist as to whether it is efficacious. The administration of an attenuated virus is not advocated by the American Public Health Association.

Serum of poliomyelitis convalescents has been tried as a remedy in the preparalytic stage, but statistical proof of its efficacy or otherwise, in the absence of strict control groups, is considered impossible.

At one time poliomyelitis was regarded as an acute infectious fever which might or might not lead to invasion of the nervous system. The work of Hurst and Fairbrother has shown that the virus reaches the nervous system by the axis cylinders of the olfactory nerve, enters the olfactory bulbs and is spread thence by axonal channels. Faber and Gebhardt have infected monkeys by the nasal route and have traced the spread of the virus from the mucosa to the ventral horn cells.

The curve of mortality from acute rheumatism has continued to fall during the past fifty years. But in the years 1933 and 1934 a rise occurred in the death-rate at all ages from rheumatic fever. The rise in mortality is correlated with the prevalence in these years of scarlet fever, tonsillitis, and other manifestations of infection by *Str. hæmolyticus*. The association of acute rheumatism with scarlet fever, erysipelas, septicæmia and puerperal fever, was shown by epidemiological methods by Galabin and Longstaff before it was known that these diseases are bacteriologically associated with hæmolytic streptococcal infection. Sir Arthur MacNalty states that as acute rheumatism chiefly affects the young age-groups, it will be fully dealt with in his Report on the Health of the School Child for 1936.

Research work carried out by Dr. Stuart-Harris at the British Post-graduate Medical School on hæmolytic streptococcal fibrinolysis would seem to indicate that hæmolytic streptococcal infection, so intimately associated with acute rheumatism, is much less related to rheumatoid arthritis.

The British Committee on Chronic Rheumatic Diseases appointed by the Royal College of Physicians issued a report in 1935, which contained a classification dividing chronic arthritis into two great types—rheumatoid or atrophic type and the osteo-arthritic or hypertrophic type.

The atrophic arthritis occurs chiefly in women of child-bearing age, and

has many of the features of a true toxæmia. Much work has been done on the blood changes in this disease. The rapid sedimentation rate of erythrocytes is one of the cardinal diagnostic features which distinguish it from osteo-arthritis.

Davis and Chandler showed that the globulin fraction tends to rise in rheumatoid arthritis, whilst the albumin tends to fall. In osteo-arthritis cases there is little or no change in the protein fraction.

The Arthritis Committee of the British Medical Association state that controlled experiments are needed to determine the value of the numerous therapeutic methods advised for the treatment of the various forms of arthritis. The principal requirements for any reduction of the great morbidity from the chronic rheumatic diseases are briefly summarized thus: (1) Research into causation; (2) investigation of the comparative value of the widely different therapeutic measures; (3) increased provision for the different forms of physical treatment which cannot be provided by the practitioner; (4) increased in-patient accommodation, especially in the form of research units in hospitals.

We hope in a later Editorial to deal with other sections in Sir Arthur MacNalty's most interesting Report.



Clinical and other Notes.

INVESTIGATION INTO A SPECIAL STRAIN OF STAPHYLOCOCCUS.

BY CAPTAIN B. N. KHAN,
Indian Medical Service,

AND

JEMADAR L. C. AGGARWAL,
Indian Medical Department.

DURING the summer of 1934, we noticed that very good results were obtained with autovaccines in three cases of skin lesions. This made us pay particular attention to the organism responsible which is described in detail below :—

DESCRIPTION OF THE ORGANISM.

Morphology and Staining Reaction.

Mostly in diplococcal forms, in size it is smaller than the ordinary strain of *Staphylococcus aureus*. Gram-positive but has tendency to become Gram-negative on sub-culturing. On slightly prolonged decolorization it loses its Gram-positive property.

Culture Characteristics.

Grows well at room temperature, but best at 37° C. It is aerobic and facultatively anaerobic.

Pigment production, golden in colour, is greatest at room temperature on egg and Loeffler's serum medium.

(1) *Growth on Agar*.—Growth is poor as compared with the common strain of *Staph. aureus*.

(2) *Growth on Blood Agar*.—Grows well but not so luxuriantly as the ordinary types of staphylococci. The colonies tend to become sticky after twenty-four hours' incubation but are easy to emulsify after twelve to fifteen hours' growth.

(3) *Egg Medium*.—There is marked golden pigment production on this medium, similar to the ordinary strain of staphylococcus.

(4) *Broth Culture*.—Both aerobic and anaerobic cultures were made. A granular growth was obtained which settled to the bottom. No chain formation; it retains the same diplococcal form.

Biochemical Reactions.

Gordon [1] has pointed out that great differences exist between different staphylococci in their fermentative capacity. In our series of 120, lactose was not fermented in eight cases and these were of the special strain. Whenever the special strain did ferment lactose it took four to six days.

These late lactose fermenters formed 21 per cent of the total cultures. The common strains of the staphylococci fermented lactose within forty-eight hours. Gas was never produced.

Hæmolysin.

The emulsion from twenty-four hours' old agar slopes and also the supernatant fluid from the same emulsion were put up separately with washed rabbits red blood-cells and incubated at 37° C. This caused complete hæmolysis after six hours.

SEROLOGICAL TESTS.

Preparation of Agglutinating Serum.—Agglutinating serum was prepared by injecting graduated doses of formalized broth culture of the coccus into rabbits intravenously. In all ten injections were given. The initial dose was 0·2 cubic centimetre of a twenty-four hours' old broth culture and subsequent doses were increased from 0·2 to 0·3 cubic centimetre at intervals of five days. The maximum dose was 1·5 cubic centimetres. After the eighth injection a preliminary test was made to determine the titre of the serum. Ten injections were sufficient to raise the titre to 250. The strains of staphylococci isolated in the laboratory and subcultures received from certain other laboratories in India were tested against this serum and the result is shown in the table below :—

TABLE I.

	Titre of Agglutination					
	Total cases	0	25	50	125	150
Special Strain	25	Nil	Nil	Nil	7	18
Ordinary <i>Staphylococcus aureus</i> ..	87	Nil	20	63	4	Nil
<i>Staphylococcus albus</i>	8	Nil	Nil	Nil	Nil	Nil
Total	120	Nil	20	63	11	18

Note.—As a control test, serum obtained from six patients was tested for agglutination reactions against their homologous organism (special strain). In four cases the titre of the serum was 125, and in two 50.

AGGLUTINATION ABSORPTION TEST.

These tests showed that some of the special strains contain co-agglutinins for the ordinary *Staph. pyogenes aureus* up to 1/25 which were completely removed by absorption after agglutination with the ordinary strain. In the remaining strains all the homologous agglutinins of the ordinary staphylococci above 1/25 were removed by absorption.

OCCURRENCE.

(1) *Skin Infections.* (a) *Infections of the Bullous or Vesicular Type.*—These infections are more or less of the type of Dermatitis bullosa plantaris and Pyosis palmaris (Byam and Archibald [2]). The palms and soles were

chiefly affected, along with the skin of the clefts of the fingers and toes. The lesions began as erythematous macules which developed into vesicles. The fluid removed from the vesicles contained the above-described diplococcus. The diplococci were extra- and intracellular (polymorphs). No streptococci or fungi were isolated. Fifteen cases of this type came under our observation during the period June, 1934, to February, 1936. Of these ten were Dermatitis bullosa plantaris, and five showed infection of the palms. This type of dermatitis was only prevalent during the monsoon (June to September).

(b) *Other Dermal Lesions*.—These include 30 cases of multiple boils and 5 other cases which showed eczematoid patches on the exposed parts of the body (face, neck and ears).

(2) *Chronic Ear Discharge*.—Cultures from 15 cases were examined. The special strain was isolated from 3 cases only. These cases were five to seven years standing.

(3) *Cervical Discharges*.—This strain was isolated in one case of chronic endometritis. The usual type of staphylococci was isolated from four other cervical discharges.

Table II below shows the number of cases from which the special strain was isolated.

TABLE II.

	Special strain	<i>Staphylococcus aureus</i>	<i>Staphylococcus albus</i>	Total number of cases
1. (a) Infections of the bullous and vesicular type	12	3	Nil	15
1. (b) Eczematoid lesions	3	2	Nil	5
1. Multiple boils	2	24	6	32
2. Chronic ear discharges	3	11	1	15
3. Cervical discharges	1	4	Nil	5
Total	21	44	7	72

Forty-eight cultures were received from various laboratories through the kind help of Major J. S. K. Boyd, R.A.M.C. Of these only four proved to be the special strain. It is remarkable that these were all received from the District Laboratory, Bangalore, at different times and from different sources, i.e. 1 case of chronic furunculosis ear; 1 case of chronic face lesions; 1 case of septicæmia. The organism was isolated from the blood and also from the urine of this case.

CONCLUSIONS.

In view of the above findings we consider that this diplococcus is a special strain of the *Staph. pyogenes aureus*.

The dermatitis cases occurred mostly during the monsoon season. The strain was commonest in bullous and vesicular types of skin infections (isolated from 80 per cent of the cases).

Autogenous vaccines have always been effective and a stock vaccine prepared from this strain also proved helpful in certain resisting cases.

[We thank Colonel J. A. Manifold, D.S.O., for his very valuable suggestions during the course of this investigation.]

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A CASE FOR DIAGNOSIS.

BY CAPTAIN J. S. KELLEHER, M.B.,
Royal Army Medical Corps.

THE following is so unusual a case in a military population that it is worthy of report.

Serjeant-Major J. of the Royal Inniskilling Fusiliers reported in the usual course of events for re-examination for continuance of service; he was found to be suffering from a peculiar growth on the skin of the right hand. He stated that the condition of his hand had been present since birth and that he had no trouble in entering the Army as he was very well developed for his age. The growth gives no trouble except in very warm or cold weather when it enlarges. It appears to undergo occasional retrogressions. At the time of entering the Army, the condition was apparently dormant, as no note of it appears in his Medical History Sheet. His hand at first sight appears to be covered with a large black furry glove and he feels its appearance makes him markedly conspicuous.

On close examination: the swelling on the dorsal surface is seen to extend to about 2 inches above the wrist and fingers which are almost web-like. The swelling is apparently oedematous in nature, but is not under tension (marked) and does not pit on pressure. There is a marked outgrowth of hair which, in addition to a dark pigmentation, gives the hand its peculiar "ape-like" appearance. There are also present in the skin numerous small wart-like outgrowths which are prominent, but do not give rise to any symptoms. The palmar surface of the hand is perfectly normal and the man is able to perform all his duties, including that of instructor in musketry, with full efficiency. There is no loss of power, in fact he with this hand has great power. He has below the lower border of the left scapula a simple nævus which is $1\frac{1}{2}$ inches by 1 inch; it has never given any trouble.

A differential diagnosis was necessary, the following conditions had to be taken into account: Lymphangiomata, hæmangiomata, fibroma, melanoma, melanotic sarcoma, plexiform neuroma; but "a large pigmented



nævus of the dorsum of the hand " would accurately describe the condition in the absence of a pathological report.

The case was sent to the Surgical Specialist at the General Hospital, Singapore, for his opinion and recommendation as to treatment. The following report was received :—

This is an amazing lesion to which I should be inclined to give the diagnosis of benign melanoma, though I feel sure that histological examination of several areas would show a combination of melanoma, neurofibroma and lymphangioma.

I have discussed the lesion with several of my colleagues and we are of the opinion that in view of the history, drastic treatment is not indicated. I suggested to our Radiologist the question of X-ray treatment with a view to reducing the size of the mass. He assures me that such treatment would not affect the tumour adversely, but normally could hold out no hope of complete cure. He considers that X-ray treatment might produce diminution in size and it would undoubtedly improve it to some extent by depilation and by reducing the activity of the sweat glands. I am of opinion that X-ray treatment would be worthy of a trial as any surgical procedure would entail complete excision and extensive whole skin tube grafting. As the patient is chiefly worried by the conspicuousness of the lesion, I suggest a mitten of flesh coloured stockinette to cover the area.

This patient has had three X-ray applications at intervals of a week and then discontinued them on his own initiative, I think because there was no apparent improvement.

(Sg.) B. M. J.,
Acting Senior Surgeon.

There is nothing in the family history worthy of note. He is one of a family of seven and there is no trace of a similar condition or of hereditary nævus in any other member. He was born in Shwebo, Burma, but there is no question of "colour" in the family history. His present age is 38, and he has twenty-three-and-a-half years service. His foreign service is: France, four years war service, and North Russia, one year.

My thanks are due to Dr. B. M. Johns, F.R.C.S.E., and his colleagues of the Civil General Hospital, Singapore, for their valued opinion on the case and the use of their library.

To Lieutenant-Colonel O. W. McSheehy, D.S.O., O.B.E., M.B., Officer Commanding the Military Hospital, Tanglin, and to Colonel E. Gibbon, O.B.E., M.B., A.D.M.S. Malaya Command, for permission to send this case for publication.

AN IMPROVED (UNIVERSAL) LORRY FITTING FOR STRETCHERS.

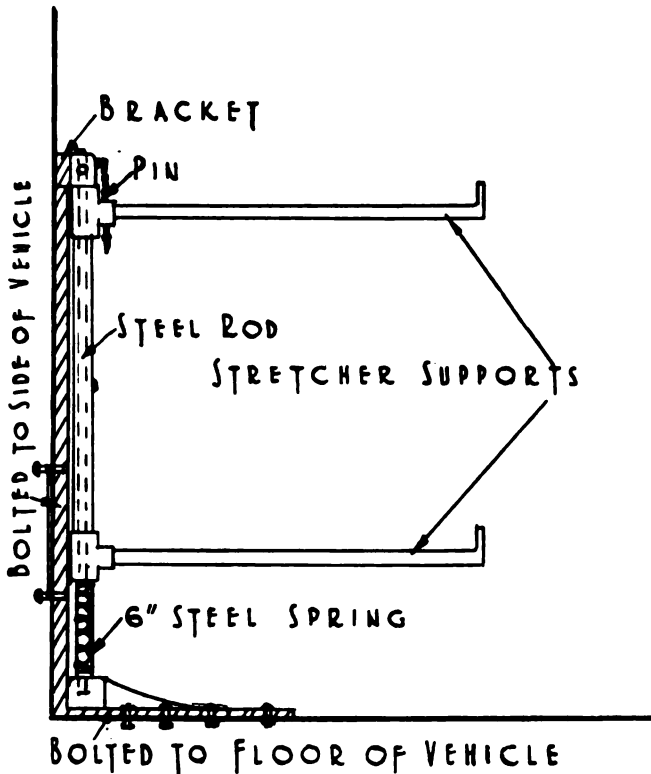
BY MAJOR F. R. H. MOLLAN, M.C.,
Royal Army Medical Corps,

AND

LIEUTENANT H. L. FLINT,
Royal Army Service Corps.

THE new lorry fitting for stretchers, as described in an article published in the issue of the *Journal* for November, 1936, was designed primarily for Service vehicles.

Since then it has become apparent that such equipment should be



Section through vehicle. Scale 1 inch to 1 foot.

adaptable to any type of civilian vehicle capable of carrying stretchers, and we have therefore designed, and describe here, an improved form of equipment which can be used with either Service or civilian vehicles.

The chief difference between a Service and a civilian vehicle lies in the

height and strength of the sides, many civilian vehicles having drop sides 18 inches high and of only $\frac{1}{2}$ inch thickness.

The main components of the improved new lorry-fitting for stretchers are :—

- (1) The stretcher supports.
- (2) A steel rod and spring.
- (3) A malleable iron bracket.

The stretcher supports consist of an upright hollow steel tube from which protrude, at right angles, two tubular steel arms. A steel rod runs through the centre of the steel tube, the whole being supported by the malleable iron bracket which can be bolted to both the sides and floor of the lorry.

At the base of the steel rod is the steel spring; the stretcher supports rest on this spring which absorbs all road shocks.

The foot of the malleable iron bracket is long enough to enable the equipment to be fitted without using the sides of the lorry as support. When not in use the stretcher supports lie along the sides of the lorry and are locked in this position by a steel pin.

To bring into use, the stretcher supports are pushed out at right angles and locked into position by a steel locking pin. Only a vertical movement is now possible, the steel tube (of the stretcher supports) riding up and down on the steel rod and working against the tension of the spring.

In the above form this equipment can be fitted into practically any type of vehicle which is long enough to take a stretcher.

The steel springs are capable of standing up to a weight of three hundredweight.

AN UNUSUAL CAUSE OF BLOOD IN THE SPUTUM.

A CASE FOR DIAGNOSIS.

BY CAPTAIN F. J. O'DOWD,

Royal Army Medical Corps.

THE following is a brief description of an interesting and unusual case that was recently seen in consultation.

The patient, a young Gurkha aged 18½, who had but recently arrived in the Station, suddenly began to spit blood. His previous history disclosed nothing of note and he had in fact always been healthy. There was no family history of lung trouble. The constant spitting of blood went on for two days. He was admitted to hospital and placed on the seriously ill list. Examination of the throat showed a reddening around the right tonsil, but a bleeding point could not be seen. No unusual physical signs were elicited in the chest. He was treated with gargles. Hæmoplastin was given on two occasions but without success. A small area near the margin of the

right anterior faucial pillar was cauterized also without improvement resulting. Consultation was suggested and he was seen in the evening of the second day.

The most striking thing about him was his good condition considering his history. Every two minutes he was spitting some two drachms of deeply blood-stained saliva, but he was not coughing. He had no rise of temperature. Pulse rate was 76 and blood pressure 125/80. His blood picture was normal for this altitude (5,300 feet). Red corpuscles 5,800,000, white 5,300. Differential count: Polymorphs 75 per cent; lymphocytes 20 per cent; eosinophils 3 per cent; large monos. 2 per cent. It was considered that these findings negated any serious infection. The lungs and heart showed no variation from the normal. The redness around his right tonsil was confirmed and a small necrotic patch on the anterior pillar noticed, which was said to have been produced by the cauterization. In view of the absence of cough before spitting it was probable that the blood emanated from somewhere in the pharynx or nares. Some of the saliva was put in a test tube and it was noticed that marked hæmolysis was present and the sputum was deeply red but translucent. This gave the clue to the diagnosis.

Two weeks before, a puppy in the Mess had suffered for a day or two from steady nose bleeding. While treating him with a saline wash, a leech had unwisely peered out and betrayed its presence. It was seized with forceps, withdrawn and a cure effected. Could the patient have a similar condition?

He was once more examined. On forcibly depressing the tongue downwards and to the right a glimpse was caught of a black object. The man was amazingly tractable though without an anæsthetic. Having obtained a pair of ordinary tongue forceps, the manoeuvre was repeated, the object grasped with the instrument and removed. The prize showed itself to be a fine, large, active leech. It had attached itself to the lower pole of the right tonsil and was hanging down freely into the pharynx. The patient was entirely unconscious of its presence. The bleeding ceased immediately and the man was discharged within thirty-six hours. He admitted having drunk water from a pool while out on training a few days previously.

My thanks are due to Colonel D. F. Mackenzie, D.S.O., Quetta, for permission to send this case for publication.



Echoes of the Past.

DEOLALI FORTY YEARS AGO.

BY LIEUTENANT-COLONEL J. G. McNAUGHT,
Royal Army Medical Corps (Retd.).

READING the notes from Deolali in the NEWS AND GAZETTE for September brought to my memory many old associations. Perhaps an account of Deolali as it was may be of interest to the few who knew it then, and the many who have made the acquaintance of the post-war station.

I served at Deolali for three years during my first foreign tour, being transferred there from Bombay in 1895. I remained for two years, and returned again in 1900 for a year. After the moist heat of Bombay, Deolali with its cool nights and crisp morning air was a welcome change. At that time it was a small station, except in the trooping season, when it enlarged to receive practically all the troops entering and leaving India. I do not think the station was very popular with its floating population, but for its permanent residents it had considerable advantages. Near the railway station were the Post Office, and the bungalows of the Barrack Master and Quartermaster; further away came the Station Mess and beyond it a row of bungalows for the Commandant, Senior Medical Officer, Adjutant and Paymaster, and standing by itself under the shadow of Temple Hill, on the top of which a large Hindu temple formed a striking landmark, was the Chaplain's bungalow. Rows of one-storied stone buildings formed the barracks, most of them only occupied during the trooping season. The permanent hospital buildings were on rising ground at some distance from the rest of the station, and had only accommodation for some sixty sick. During the trooping season nearly all the invalids from India were sent to Deolali to await embarkation; although the slighter cases were housed in barracks and treated as out-patients, we often had as many as 200 in-patients, most of whom were under canvas. The railway did not run to the hospital, and all sick had to be transported in hospital bullock tongas from a siding near the station. In those days there were no hospital trains, and invalids came down country in ordinary trains, with stoppages at "rest stations" for the night. Many of them arrived at Deolali in much worse condition than when they left their stations, and there were always some who, at the close of the trooping season, were too seriously ill to leave the hospital, and had to remain there till another trooping season. My first experience of a British Military Hospital in India had been rather a shock; at home I had served at the Curragh Station Hospital, a new building with up-to-

date accommodation ; the old Military Hospital at Colaba was in painful contrast ; buildings falling to pieces, infested with bugs, no operating theatre, no microscope. A new hospital was built soon after, but on going over it before its handing over, I was astonished to find that while it had 200 beds, it had no operating theatre. It was painful to compare the old hospital at Colaba with the native civil hospitals and the St. George's Hospital for European civilians in Bombay. Our small hospital in Deolali was a much more satisfactory one, but it had no operating theatre and no nursing sisters. Operations were performed on one of the verandahs. During my time Surgeon Captain M. P. Holt (now Major-General Sir M. P. Holt, K.C.B., K.C.M.G., D.S.O.) served at Deolali and did a great deal of surgery, both among the troops and the natives, under these discouraging conditions. For nursing we depended on regimental orderlies, mostly trained at Poona, many of whom were remarkably keen on their work. The medical staff consisted of a medical officer in charge and two, or sometimes three, doing duty, with of course several assistant surgeons. Medical officers "passing through" were at Deolali for too short a time, and their movements too uncertain, for it to be worth while to employ them on hospital duties. The work of the permanent staff was hard during the trooping season, but light during the monsoon months. Although the conditions under which we worked were in many ways unsatisfactory, our death-rate was low. I do not think it would have been appreciably lower if we had had the advantage of the help of nursing sisters, but I am sure the sick would have been much more comfortable. An immense improvement would have been better transport arrangements, hospital trains with nursing attendants and suitable food, instead of ordinary trains with slow journeys broken by stays at "rest stations," and food unsuitable for really sick men. What happened in many cases was that invalids who had been carefully looked after at their stations and made fit to stand the journey home under reasonable conditions reached Deolali seriously ill. There they had to be nursed for a time before they became fit to continue their journey home. And there were no hospital ships.

Deolali was an interesting station for any medical officer keen on his profession. One saw most of the invalids from all India, and had a better opportunity of seeing rare and interesting cases than at any other station.

Cases of abscess of the liver were common in those days, before the treatment of dysentery and incipient liver abscess by emetine had been introduced. The treatment of amœbic dysentery by ipecacuanha powder was satisfactory if started early enough and if carefully carried out, in spite of the patients' objections to its discomfort. Unfortunately a preparation called "ipecacuanha sine emetine" was sometimes used, and this preparation of ipecacuanha deprived of its useful, if disagreeable constituent, was issued to hospital from government stores. I do not remember why I never employed it, but I never did. I stuck to the ipecac. with its emetine.

Another kind of case, which is practically never seen now, was the terrible advanced case of syphilis, chiefly among invalids from Madras and Burma who had suffered badly from malarial fever.

I well remember one man I looked after in an isolation tent who was covered with great sloughing tertiary ulcers which stank so that at the first dressing I made the orderly who assisted me fell fainting across the patient's bed. The patient got well under treatment. I had good results by using mercurial injections, which were just being introduced at the time.

Stimulated by the example of Surgeon Captain C. Birt (Colonel C. Birt) with whom I had served at Colaba, I invested in a Zeiss microscope, which was my constant companion during my service. Malarial fever was fairly prevalent at Deolali, especially in the rainy season, when I had plenty of time on my hands, and I was, I think, one of the first in India to use the microscope in its diagnosis. I wrote to Dr. Manson (afterwards Sir Patrick Manson) for tips on the subject, and this busy man found time to send me a long type-written letter containing much useful help. I also had at my disposal Laveran's "*Paludisme*," and the recently published volume of the New Sydenham Society, containing translations of the monographs on malaria, by Marchiafava and Bignami, and Mannaberg. Later, when on leave in England in 1897, I met Manson, who gave me practical demonstrations on the examination of blood for the malaria parasite. During my leave I also took a post-graduate course on bacteriology, with special reference to the diagnosis of typhoid by the Widal test, just coming into use. On my return to India I had soon plenty of opportunities to use the test for diagnosis, as I went to Quetta and soon found myself in the midst of a very severe epidemic of typhoid.

In India these were interesting times. The "air borne" theory of the origin of cholera was then in favour at official headquarters, and troops were marched at right angles to the wind to avoid infection. Not long before the diagnosis of typhoid fever had been a very serious matter—for the medical officer who diagnosed it—as the official view was that typhoid fever was very rare in India, and consequently "remittent fever" and "simple continued fever" were the labels usually attached to cases that were really typhoid. Only the most marked cases were correctly diagnosed: naturally the recorded death-rate from typhoid fever was extraordinarily high in proportion to the number of cases diagnosed. Ernest Hart's visit to India, and his outspoken comments on his experiences, led to the spread of more enlightened views. A new era was dawning, and the work of Bruce, Leishman, Rogers and Ross was to put tropical medicine on a sound footing.

Between the trooping seasons duties at Deolali were not exacting. The permanent garrison consisted of a Company from the British Infantry Regiment stationed at Colaba: we also had some convalescents, a few invalids who had had to be kept back for the next season, and the staff

and students of the School of Musketry. Deolali was a healthy station : there was a certain amount of malarial fever, and a few cases of typhoid from time to time ; although cholera was sometimes prevalent in the villages around I do not remember a single indigenous case among the British troops : occasionally a case was detected on troop trains during the trooping season, and once there was a slight outbreak in a camp of native followers awaiting embarkation for China. The water supply came from a number of shallow wells, and one of my duties was to go round once a week and drop the regulated amount of permanganate of potash into each for the prevention of cholera. One of these wells was the home of a large tortoise, who was always very much disturbed by being permanganated, but appeared none the worse afterwards.

The writer of the notes from Deolali in the *NEWS AND GAZETTE* mentions its former unenviable reports. This was probably due to the scandals about tampering with the pay of details going home, and unfairness in the selection of men for the transports. Such a reputation takes a long time to die down. It was previous to my acquaintance with the station that the scandals came to a head, and resulted in an investigation which led to changes in the staff and in the administration. In my time the Commandant, Lieutenant-Colonel Fitzherbert, was devoted to his job ; he was a regular autocrat, and it was very improbable that any gross irregularities could exist without his discovering them and putting them down. The Quartermaster, Major Pringle, was one of the best I ever met, most efficient and reliable ; through the influence of Colonel Fitzherbert he afterwards received an important appointment in the Egyptian Coast-guard Service, and had a long and successful career in that country. With so many men constantly on the move, and a small permanent staff, there must have been irregularities that escaped notice, but nothing like those that gave Deolali its bad reputation.

One incident connected with the wet canteen I remember very clearly. Towards the end of one trooping season a time-expired man in a Scottish regiment contracted smallpox and had to remain in the station till the next season. I had looked after him in his illness, and so got to know him well. He had an Irish name, a very pronounced Glasgow accent, and was the son of a publican in Greenock. One evening during the monsoon when driving home past the canteen, a man with a mug of beer in his hand stepped out from the side of the road and asked to speak to me. It was my former smallpox patient, and his complaint was that the beer was so weak that it must have been adulterated. I told him that I would look into the matter, and on visiting the canteen next day took samples of beer for analysis. I found the beer contained under 2 per cent of alcohol, and reported the matter. The responsibility for the adulteration could not be brought home to anyone, but the beer was stronger in future.

Our amusements in Deolali were simple. There was the usual Club, with tennis courts attached, and we had a golf course—rather a rough one,

as the ground was hard and broken up by fissures and nullahs, and overgrown in parts with spear grass, which was rather trying for one's ankles. At Nasik, a few miles away, there was quite a good golf course. In the monsoon months we played hockey, in which the sepoys and native N.C.O.'s attending the School of Musketry showed great enthusiasm. There was very little shooting close to the station, though good small game shooting could be got within a reasonable distance. The only big game I can remember was a panther shot by the Barrack Master's son some few miles away and taken all round the station to be exhibited.

A great place for picnic parties was the hills, near Nasik, where we used to climb up to the temples, with their monkish cells and images of Buddha, all cut out of the solid rock. Nasik itself was an interesting place to visit, a holy city full of shrines and temples, with bathing places on the Godavari, crowded with devotees. When I left Deolali in 1901 I little thought of the changed circumstances in which I was to see it again. In April, 1918, I came to India once more and was first stationed at Jhansi, during an uncommonly trying hot weather. I got ten days' leave to go to Deolali, where Captain Rutherford, who had served with me as pathologist to No. 30 General Hospital, was stationed, and whom I was anxious to meet again. Deolali in the monsoon—it was a weak monsoon that year—was like Paradise after some months in Jhansi.

It was a very different Deolali from the one I had known. The first thing I noticed was a fine hospital train in a siding near the station. There were two general hospitals, one in the old cantonment barracks, and the other in fine new infantry barracks which had been built near the former Station Hospital, which was now the R.A.M.C. Dépôt. There were many troops stationed at Deolali and Nasik, and many new bungalows stretching out below Temple Hill. What interested me most was the new water supply which Captain Rutherford took me over. The old wells would have been quite unequal to supplying the wants of the greatly increased population. A new supply had been obtained by sinking shafts close to the Godavari: the river water—very impure to begin with—percolated through the sandy banks into the shafts, and was further purified by the addition of chlorine by an automatic appliance, and was finally filtered through alum and sand under pressure. The end-product was examined frequently bacteriologically, and always found of excellent quality.

I spent a very pleasant leave, but in spite of the new water supply, the well-equipped hospitals with their nursing sisters and R.A.M.C. orderlies, the hospital trains and hospital sidings, I felt that the old Deolali, with all its drawbacks, was a more homely place.

WAR EXPERIENCES OF A TERRITORIAL MEDICAL OFFICER.

BY MAJOR-GENERAL SIR RICHARD LUCE, K.C.M.G., C.B., M.B., F.R.C.S.

(Continued from p. 205.)

CHAPTER XXI.—GAINING GROUND. DECEMBER 12.

It had originally been intended to push on North along the Nablus road immediately after the capture of Jerusalem, but the need for clearing the ground east and north-east of the town caused the advance to be delayed for a fortnight. It was found by reconnaissance that the Turks were still in force between Jerusalem and Ram Allah ten miles north, and were holding on to the rough country to the west between Ram Allah and Beit Ur el Foka. It was decided, therefore, to make the next move a concerted piece by two forces; one moving northwards along the Nablus road and the other across the hills slightly north of east, both converging on Ram Allah.

The right advance was to consist of the 60th Division supported on the right flank by the 53rd Division, and the left advance was to be made by the 10th Division. The 74th was to fill the space between the two forces and act as the hinge of the nut-crackers.

While the preparations for this operation were in train the Turks counter-attacked on the east of Jerusalem and made a strong effort to re-take the place.

After the capture of Jerusalem they had not withdrawn far, either northwards or eastwards, and retained both their lines of communication—the Nablus and the Jericho roads. By the latter they were able to maintain a force on the foot-hills east of the Mount of Olives, only about one and a half miles away. The 53rd Division had gradually pushed them back until we were holding the prominent hills about four thousand yards east north-east of the Mount of Olives known as the Suffa Ridge. This had a well-marked spur jutting out eastwards from it known from its chalky bareness as White Hill.

There had been much fighting over the original possession of these hills, and the 53rd Division had had a good many casualties in acquiring them.

On December 26 the Turks made a determined attempt to re-take them, and there was heavy fighting. The enemy came on three distinct times, but without success and in the effort had very heavy losses.

This victory decided the Corps Commander to push on at once with the northward advance which began, therefore, on December 27.

The most formidable obstacle to the advance of the left force was a high plateau running east and west known as the Zeitoun Ridge. The ridge has exceedingly steep terraced sides both to the north and south and ends very abruptly at the western extremity. The only accessible approach to

it is at the east end. It was, therefore, a very difficult proposition. It lay in the route of the southern of the two brigades of the 10th Division and of the brigade of the 74th attached to it. The capture of this ridge cost over two hundred casualties.

The northern brigade, moving on Ain Arik, also had a stiff fight and had about one hundred and fifty casualties.

The medical arrangements for this operation were complex owing to the fact that the two forces had quite distinct lines of evacuation, that of the left force being over exceedingly difficult ground.

The collection of wounded in this operation presented some of the greatest difficulties met with in the campaign. There were no roads leading up into these hills. The tracks were not suitable for wheeled vehicles, and camels could not go out of the valleys. On the almost inaccessible Zeitoun Ridge on the night of the 27th there were a hundred lying cases to be got away. It had been arranged that if it were found to be practicable, after the first objective was gained, some of the evacuation should be done through the 74th Field Ambulances at Kubeibeh. During the night of the 27th the A.D.M.S. of the 10th rang up Corps Headquarters asking for assistance if possible from this direction. The A.D.M.S. 74th promised to send out a convoy of camels with cacolets from the 231st Field Ambulance to help. It was a very long way round to the plateau from the Beitania end and the convoy did not arrive until 11 a.m. on the 28th. In the meantime a considerable number of cases had been got away but some could not be moved before the 29th. There was a mosque on the top of the ridge which gave very fair shelter and none of the cases were much the worse for their rest there. Practically all the lying cases had to be carried down the steep slopes by hand and then for a distance of five miles before they could be got into sand carts. It was a fine piece of work. The mule litters which we had asked for but could not obtain in time for this operation would have proved very valuable for the serious cases. The field ambulances were fortunately well supplied with medical comforts.

The operation of the right attack presented little difficulty from a medical point of view. The manœuvre was quite successful and all the objectives were reached, and the important village of Ram Allah was now in our hands.

The enemy were now cleared well away to the north, the front line being more than ten miles from Jerusalem. On the east he had received such a lesson that he was not likely to give further trouble from that direction.

On January 2 Corps Headquarters moved up from Latrun to the Kaiserin Augusta Victoria Hospice on the Mount of Olives. This building, begun after the Kaiser's memorable visit to Jerusalem in 1908, was finished in 1911 and was opened by Prince Eitel Fritz, the Kaiser's second son.

Perhaps more than anything in Palestine this building epitomizes the character and policy of the Germans. Placed on the most prominent part

of the Mount of Olives it dominates the city on the one hand, and on the other commands the most beautiful view of the Jordan Valley and the Dead Sea. A mass of ugliness from without, it is built regardless of expense with a solidity, a scientific regard for hygiene and comfort which typifies the thoroughness of the race. Added to this there is a wealth of artistic decorative work within the building which represents their search after culture, but which from its very pretention just misses real beauty.

The idea of the founders, at first sight not quite obvious, becomes clearer when one dips into the deeper motives of the people who built it.

Before the War they could not fill the place with their own people and were ready to admit even English people as paying guests. As a "hospice" or home for pilgrims, it was not needed, for the Germans who visited Jerusalem were tourists or business men and not pilgrims. As a place of worship the Chapel, on which they must have spent so much, fulfilled no function, for Jerusalem contained already excellent modern German churches, both Lutheran and Catholic.

The bronze statue of the Kaiser, dressed as a Crusader, in the courtyard, is a bizarre mixture of arrogance and fanaticism, while the fresco on the ceiling of the chapel, which portrays William and his Consort in one panel and the Almighty in the adjoining one, mutually surrounded by the apostles and prophets of biblical history, is little short of blasphemous in its design.

The whole building is a symbol of the pre-War mind of the Kaiser and his people and an attempt by them to plant the seed of the new German "Culture" in the cradle of the old Christian culture. They were doing this in a country which in no way belonged to them and in which they had no special interest, except in so far as they hoped to make it a stepping stone to world power in the east. No doubt, but for the War, they would have been successful.

Our own relations to the place are interesting as typifying our national characteristics. Within a few hours of the surrender of the town and almost before the Mount of Olives was clear of Turkish troops, a brigade headquarters was lunching in the dining room of the hospice, served by the German sisters who were in charge, and paying for their meals according to tariff, as if it were an ordinary hotel. When the 20th Corps Headquarters took it over a month later, the sisters remained in charge of the domestic arrangements, cooking for the messes and on terms of mutual courtesy and respect with their guests.

During the whole six months that they remained, there was no friction and no hint in our relations of the life and death struggle that was going on between the two nations. The statue of the Kaiser remained in its niche in the courtyard, the photographs of his triumphal procession into Jerusalem still hung on the walls inviolate. There may have been a risk in retaining these potential spies in our midst, but it was one almost worth running if it could prove that war had not blotted out from us the spirit of

chivalry and respect towards those whom circumstances had made our enemies.

Now that we were settled in Jerusalem we had the opportunity for a little sightseeing and for entering into the spirit of the place and studying its history. Very careful regulations were made to prevent vandalism and disregard for the susceptibilities of the innumerable sects and religious schools of thought which are represented in the city, but ample facilities were given, under guidance and control, for everyone to see all that there was to be seen. The padres were indefatigable in conducting parties of soldiers round the places of interest, and the "Tommies" took full advantage of their chances. They proved inveterate sightseers. One used to see gangs of twenty to thirty going solidly round the holy places, full of respect and interest with never a sign of coarseness or flippancy in their behaviour. It was only one, but a typical proof of the inborn gentlemanliness of the average British soldier, of his respect for the greater things and the greater thoughts of life, even though these do not form a very large part of his own life.

Two very different and opposing thoughts emerge as the result of a visit to Jerusalem. Imbued with the western love of order, completeness, thoroughness—one could not help being disappointed by the dirt, the squalor and the dilapidation, in the true sense of the word, of it all. The gross superstition of the sects, the petty jealousies and squabbles in holy places, were particularly galling. The failure of their religion to stir the devotees out of their own pettiness and to bind them into a common cause for the good of the world, was at once apparent. The failure of Jews, of Christians, of Mohammedans, in long succession, to produce any satisfactory result by the service of their God was brought home to one, with depressing force. The temple, the Mosque of Omar, the Christian churches, all decayed or decaying, have had little influence, or even bad influence, on the life and happiness of the people of Palestine. On the other hand one cannot help reflecting that in this little place were cradled some of the greatest thoughts and motives of the world's history. Here the Jews formulated the Unity of God, here lived and died the greatest Teacher that ever appeared on earth, here the Moslems established a shrine second only in holiness to that at Mecca. Each religion in turn has devoted thought and energy to trying to symbolize these ideas, and the symbols, though now decadent and often squalid, are still visible to remind us of their origin and of the influence that these ideas are still exercising over the wide world.

One of the first problems that had to be faced when Jerusalem was taken and active operations were over for the moment, was the question of housing the troops. Jerusalem had a very bad reputation from a health point of view, and the surrounding villages were equally bad. The sanitation of the town was shocking, the water was derived almost entirely from rain water cisterns supplied from catchment areas often entirely unprotected and by no means above suspicion. These cisterns were often

of faulty construction and liable to subsoil contamination. The buildings are for the most part verminous and in the summer months malaria is rampant. At the same time the weather in winter is very severe. There is a heavy rainfall and a large amount of bitter cold wind. During the operations the troops, especially the Egyptians, suffered badly from the cold and wet, and the sick rate rose considerably, though never to an alarming extent. On the bleak hills near Nebi Samwil there had been not a few cases of trench feet. Owing to transport difficulty it was quite impossible to get up tents or shelter material. The difficult question had therefore to be faced whether to keep the men in billets in the town and villages with protection from the weather, or keep them outside in their bivouac tents which afforded very little protection, so as to do away with the risk of outbreak of typhus, relapsing fever, and dysentery. The question of malaria did not occur in acute form until later in the year.

After mature consideration it was decided to allow them to remain in the billets which they had instinctively found for themselves until the end of February, when it was hoped that the worst severity of the weather would be over and the risks of malaria not yet begun. This recommendation was accompanied by instructions for a careful watch over sick incidence and strict regulations in sanitary matters. The result justified the decision. The sick rate did not become excessive, the men were in comparative comfort, and there was no epidemic outbreak, though towards the end of the period a few cases of typhus occurred. All through the month of January the problem of evacuation was an anxious one. The Turkish railway from Junction Station to Beit Hanun, on which we depended to connect up with the broad-gauge railway from Egypt, had been made in the summer of 1917. Its vagaries in fine weather have already been described, but when the rains came it collapsed altogether and was out of action for some weeks. The road on the same route is only a dry weather road and became impassable after heavy rains. It became necessary, therefore, to hold up the sick and wounded for days at a time in Jerusalem. At the same time it was impossible to get any properly equipped military hospitals up to Jerusalem. Fortunately accommodation was ample and good preparations had been made by the field ambulances to make their hospitals comfortable, so that the pressure was never felt by the sick themselves. In fact it was probably better for them than being transported in the severe weather. A good move was made as early as January 3 in getting a matron and ten Army nursing sisters up to Jerusalem to superintend the nursing in the field ambulance hospitals. On their journey up to Jerusalem in motor ambulances these ladies received a veritable ovation from the troops. The first casualty clearing station did not reach Jerusalem until February 15.

Transport difficulties made the supply of rations and forage an anxious problem at this time and both men and horses often had to go on pretty short rations. The civil population of Jerusalem was in a bad way at the

time of the capture. The stocks of food had got down to a very low point and it was very hard to find transport to bring up any more. It was a strange and moving sight to see a butcher's shop formed round a camel that had dropped exhausted by the way. A very short time elapsed between its demise and its becoming a skeleton. The pinch of hunger was visible on a large proportion of the faces. The long-curled anæmic Jews of Jerusalem, who looked as if they had never done any manual work in their lives, were to be seen on the roads only too ready to break stones for their daily meal. This did not last long and after very few weeks, though large numbers of local inhabitants were still required for work, the curly locks disappeared with their hammers and shovels. With the advent of the Christian stranger they had found a more lucrative and less exhausting means of subsistence than road making.

On January 25 I proceeded on leave to England and was absent from Palestine for seven weeks. It was nearly three years since I had left home. I travelled by sea to Taranto and thence by train through Italy and France to Southampton. The sea voyage, though tedious, was uneventful. I was fortunate in being permitted to travel by ordinary express train and so escaped the delays and discomfort of the ordinary land journey by troop train. A twelve hours' wait in Rome gave me the opportunity of doing a little sightseeing and renewing acquaintance with some of the more interesting places. My return journey was equally without adventure.

During my absence two further advances had been made by the 20th Corps.

The first, on February 19, effected the capture of Jericho and the clearing of the Jordan Valley up to the river bank from the Dead Sea in the south to the Wadi Auja in the north.

The second, beginning March 9, was an advance of the line northwards for about six miles carrying it roughly to the line of the Wadi Jib or just beyond it. This advance was accompanied by a corresponding move forward by the 21st Corps on the left. It left the eastern flank of the corps thrown back so as to keep connexion with the troops in the Jordan Valley. The operations were quite successful and no special points of medical interest occurred.

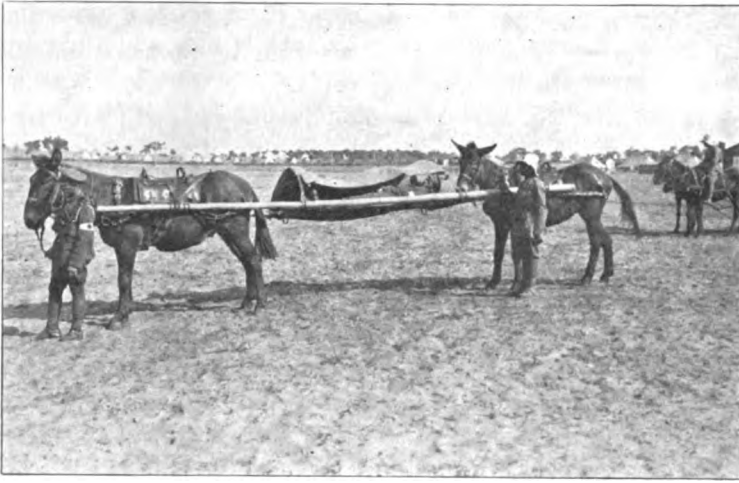
Towards the end of February there was an alteration in the establishment of the field ambulances. The camels for carriage of equipment and water were replaced by mule-drawn vehicles and water carts. The establishment for transport of patients was also considerably altered. There was much correspondence on the subject, very active representation being made for the need of some kind of mule carriage either in the form of litters, *travois*, or cacolets. The final outcome of all this was a new provisional establishment by which each field ambulance had :—

Ten motor ambulances, four heavy and six Fords ;

Six light horse ambulances ;

Four sand carts.

In addition, fifty camels per field ambulance with thirty-four pairs of lying and sixteen pairs of sitting cacolets were to be borne on the strength of the divisional camel companies, earmarked for the field ambulances and detailed for use as required. Each field ambulance was also to be provided with nine mule litters constructed locally from bamboo poles, each litter to be



carried by two mules by means of pack saddles. No extra mules were provided for them, and their use was alternative with that of the other means of transport. The arrangement was not very satisfactory, but owing to difficulty in getting mules it was the best that could be obtained.

(To be continued.)

Current Literature.

SILER, Col. J. F., M.C., *et al.* Protective Antibodies in the Blood Serum of Individuals after Immunization with Typhoid Vaccine. *The Military Surgeon*, 1937, lxxx, 91.

The work detailed in this paper was undertaken to study the degree of protection afforded by inoculation with different strains of typhoid bacillus.

The authors first satisfied themselves, by intraperitoneal inoculation of mice, that such strains vary greatly in virulence. The strain used as a routine in the manufacture of typhoid vaccine at the U.S. Army Medical School (Rawlings—intermediate) fell in the group of low virulence.

Among the virulent strains was “rejuvenated” Rawlings supplied by Bensted.

Certain virulent and non-virulent strains were then selected. From these, vaccines were prepared, with which human volunteers were

inoculated. Subsequently, serum for test purposes was collected from these volunteers.

The antibody content of this serum was estimated by its power to protect mice from infection with typhoid bacilli. A pure genetic strain of black mice was used throughout. One-tenth of a cubic centimetre of the serum to be tested was injected intraperitoneally into a number of mice, followed within half an hour by graded doses of living typhoid bacilli suspended in mucin. The power of a serum to prevent infection was shown by survival of the mice, or vice versa.

It was found that the serum of men inoculated with virulent strains had greater protective powers than the serum of those inoculated with non-virulent strains.

From this it is concluded that the strain of typhoid bacillus used for the preparation of vaccine should be (a) highly virulent and (b) highly immunogenic, as demonstrated by active and passive immunity tests in a selected breed of mice. (As the two virulent strains tested were apparently alike in their protective power, the reason for attempting to differentiate (a) and (b) is not very clear.)

It will be seen that this work, approaching the question from the angle of passive immunity, confirms the conclusions reached some years ago at the Royal Army Medical College, London, where since 1934 these principles have been applied to the manufacture of T.A.B. Vaccine. When first published, these conclusions were not accepted by the U.S. Army Medical School (*vide* reviews in *The Military Surgeon*, 1933, lxxiii, 329, and 1934, lxxv, 265-6) and it is gratifying that subsequent experience has modified the opinion of these workers, though it is perhaps rather peculiar that they now publish these same conclusions without reference to or acknowledgment of the British work.

J. S. K. B.

TOPLEY, W. W. C. and Others. The Immunizing Potency of Antigenic Components isolated from Different Strains of *Bact. typhosum*. *Lancet*, January 30, 1937.

In earlier papers Raistrick and Topley and their colleagues reported the isolation from *Bacterium typhi murium* (*Bact. aertrycke*) of a fraction which on injection into mice induces an active antibacterial immunity of the same order as that induced by the whole bacterial cells. The fraction is toxic for mice and rabbits and its injection in minute amounts renders these animals resistant to a few minimal lethal doses of the toxic fraction itself. The antitoxic immunity is of low order and is sharply differentiated from the high-grade antitoxic immunity that is readily developed against the exotoxins, such as those of *Corynebacterium diphtheriae* and *Cl. tetani*. Chemically this toxic and antigenic component consists of a polysaccharide linked with a substance which is, perhaps, a phosphatide. This component was obtained by acetone treatment of the bacterial bodies followed by tryptic digestion and alcohol precipitation. When the complex antigen is

heated to 100°C with decinormal acetic acid it splits into the polysaccharide component which remains in solution, and the phosphatide component which is precipitated. The polysaccharide component is entirely non-toxic for mice; the phosphatide component retains some toxicity, but is much less toxic than the complete antigen.

The work of Felix and his colleagues and the studies of Perry, Findlay and Bensted on the efficacy of various typhoid strains as immunizing agents in mice have made it a matter of great importance to obtain a reliable immunizing agent as a prophylactic against human typhoid. Topley and his colleagues thought the problem might be attacked on the lines of their studies on *Bact. typhi murium*. In these experiments they used the rejuvenated Rawlings strain (RR) which is inagglutinable by "O" anti-serum, and the well-known "H" 901 strain which is readily agglutinable and has a minimum lethal dose for mice of 1,000 million bacilli, compared with the less than 100 million dose of RR. The RR strain is of the "Vi" type and 901 of the "O" type, or more strictly the "H"-"O" type. From each of these strains a purified antigen was prepared by the same methods as were employed in the studies on *Bact. typhi murium*. The purified antigen, called F68, was treated with oxalic acid which removes an appreciable amount of calcium present, and further purified by repeated alcoholic precipitation from acid and neutral solutions.

The first experiment made was to determine whether RR (F68) would induce an active immunity of the same order as that induced by the whole bacterial cells, viz. by killed bacterial cells from a "Vi" strain of RR. This was found to be the case; there was no significant difference between that induced by the purified antigen and by the whole bacteria.

The next experiments were made with the object of testing the relative immunizing potency of the fractions from "Vi" RR and "O" 901. When two doses were given subcutaneously the "O" 901 bacteria and the F68 fraction derived from it were found to be quite ineffective. When *two intraperitoneal* injections were employed the fraction and the whole bacteria were not without effect, and when *three intraperitoneal* injections were given, the 901 bacilli and the purified antigen gave an immunity of the same order as that induced by the RR bacilli or the RR antigen. The immunity produced by the purified antigen was slightly, but insignificantly, less than that induced by the killed bacteria cells.

Anti-sera were then prepared by injecting rabbits with the purified fractions RR/F68 and 901/F68. Both sera were found to exercise a very definite protection against living Vi-typhoid bacilli; 901/F68 was slightly less effective than RR/F68, but the difference was not significant.

Preliminary chemical studies showed that while 901/F68 antigen and the *Bact. typhi murium* F68 antigen are indistinguishable, the RR/F68 antigen differs in many important chemical reactions from the other two.

From these experiments Topley and his colleagues conclude that it appears possible to isolate from suitable strains of *Bact. typhosum* a

chemically pure and stable antigen that has the immunizing properties of the whole bacterial cells.

BENTLEY, F. J. **Artificial Pneumothorax: Experience of the London County Council.**—*Med. Res. Council Spec. Rep. Ser. No. 215.* 94 pp. With 5 figs. 1936. London: H.M.S.O. [1s. 6d.]

In 1922 the Medical Research Council published a report (Special Report Series No. 67) on Artificial Pneumothorax by Dr. L. S. T. Russell and Dr. (now Sir) Arthur S. MacNalty. Collapse therapy was at that time only used to a limited extent in Britain; now it is practised in nearly all tuberculosis institutions. The time was ripe, therefore, for a valuation of results, and the new report by Dr. F. S. Bentley sets forth the experience of the London County Council. For this purpose 677 cases receiving artificial pneumothorax treatment have been followed up for periods varying from three to thirteen years, and a comparison has been made with 3,329 control cases receiving conservative treatment alone and followed up for five years. The two groups were drawn from identical sociological and environmental sections of the population, and have been classified and followed up in a uniform manner and the results worked out on an actuarial basis. In only 7.2 per cent of the cases had tubercle bacilli never been found. It is noteworthy that only 38.3 per cent of the cases were males. The average duration of artificial pneumothorax treatment was 18.8 months. The results show "a gain in lives of 129.53 at the end of three years, that is an increase in the number alive over the expected number amongst those conservatively treated of 19.1 per cent." Incomplete collapse, etc., tends, of course, to indifferent results and these, as the author notes, drag down the general level of results. They formed 60 per cent of the whole, and of 267 investigated in detail, only 50 per cent survived a period of three years. In both sexes the best results were obtained in the age-groups 25 to 30.

The patients in the pneumothorax group had longer residential treatment, better after-care and more frequent subsequent periods of treatment than did those in the conservative group, and the author rightly emphasizes these factors in assessing the value of the treatment. If the case is unilateral, collapse incomplete, tubercle bacilli still present in the sputum, and the patient not making satisfactory progress, Dr. Bentley considers that in view of the hope held out nowadays by thoracic surgery, more radical surgical measures of collapse of the lung should be considered. He gives a timely warning also as to the dangers of entrusting artificial pneumothorax work to inexperienced physicians.

The report also contains a preliminary section surveying the literature of the subject since 1922, with 100 references. This section gives the experience of workers practically all over the world. The report is a very valuable contribution to the study of artificial pneumothorax.

S. ROODHOUSE GLOYNE.

Reprinted from "Bulletin of Hygiene," Vol. 12, No. 1.

Reviews.

ANNUAL REPORT OF THE SURGEON GENERAL, U.S. ARMY, 1936.

Washington : United States Government Printing Office. Pp. 216.
Price 20 cents.

The annual report of the Surgeon General of the United States Army has just been received.

It would be well to explain the organization of the United States Medical Services. At the head is the Surgeon General whose office is administered by 10 formal divisions namely : (1) the Administrative Division ; (2) the Finance and Supply Division ; (3) the Military Personnel Division ; (4) the Planning and Training Division ; (5) the Professional Service Division ; (6) the Statistical Division ; (7) the Library Division ; (8) the Dental Division ; (9) the Veterinary Division ; (10) the Nursing Division.

In the last fiscal year there has been a reversion to an organization which was in effect many years before 1931. The results have been very satisfactory.

It will be seen from the above that the United States Medical Services are much more self-contained than those of the British Army.

The total strength of the U.S. Army during the year 1935 was 142,568 of which 66,086 were enlistments, original, or re-enlistments. There was an increase in the number of original enlistments amounting to 55 per cent of the total. As recruits are more susceptible to infectious diseases than seasoned troops the admission rate is found to be increased accordingly. Of the total Army, whites comprise 71·08 per cent ; the remainder is made up with coloured enlisted men, Filipinos and Puerto Ricans.

The general health of the Army was satisfactory ; the admission rate for all causes was very similar to that of last year, namely, 607 as against 602 per thousand.

There were 1,387,945 days lost in hospital by the military personnel as compared with 1,363,591 days for the previous year.

The chief causes of admission were athletic exercises, bronchitis, gonorrhœa and influenza. Panama has the highest rate, then comes China and the Philippine Islands.

The greatest number of discharges for a disability was for nervous diseases followed by those for tuberculosis, pes planus, and otitis media ; nervous and mental diseases also head the list of causes of invaliding from overseas stations.

Venereal disease shows a slightly higher admission rate for 1935 (35·1) than for the previous year (34·4), but considerably lower than 1932 and all preceding years. The rate in China was lower by 17·3 per cent but was somewhat higher in Panama. Gonorrhœa ranks first in the list of diseases causing non-effectiveness and in the number of work days lost.

Acute tonsillitis had an admission rate of 19.9 per 1,000 and chronic tonsillitis 18.5 per 1,000. The rates were highest amongst the white troops.

The numerical strength of the Medical Corps was increased to 1,033 officers. The Reserve of Officers shows a definite gain over previous years which is attributed to a growing interest on the part of newly-graduated medical students, as well as to that of the older officers of the organization.

The Report of the Preventive Medicine Subdivision of the Professional Service Division includes a reference to X-ray examinations carried out on recruits at one of the dépôts. The results obtained have been extremely promising and encourage the belief that the incidence of pulmonary tuberculosis can be materially reduced by this means, with great saving to the public.

The health of the Commands was good. The dispersal of a greater number of young recruits than usual more susceptible to infections resulted in an increase in the admission-rate.

The report is purely statistical and there are no references to any matters of hygienic or pathological interest which a reader usually finds in such publications.

TREATMENT IN GENERAL PRACTICE. THE MANAGEMENT OF SOME MAJOR MEDICAL DISORDERS. I. Reprinted from the *British Medical Journal*. Various authors. London: H. K. Lewis and Co., Ltd. 1936. Pp. x + 248. Price 8s. 6d. net.

This work consists of reprints of the now familiar articles in the *British Medical Journal* devoted to treatment.

The first volume deals with the management of some of the serious medical disorders and includes thirty-five separate articles, each of which is dealt with by an authority upon that particular subject.

The series when complete will be a very useful addition to any medical library. D. N.

RECENT ADVANCES IN GENITO-URINARY SURGERY. By Hamilton Bailey, F.R.C.S., and Norman M. Mathieson, F.R.C.S. London: J. and A. Churchill, Ltd. 1936. Pp. viii + 213. Price 15s.

To the general surgeon there are few branches of surgery so full of difficulties and pitfalls, or requiring such infinite patience, as genito-urinary surgery, and this volume, therefore, makes a most useful and helpful addition to the series of Recent Advances. The chapter on Excretory Urography is particularly helpful, much that was formerly wrapped in darkness and mystery, owing to this single advance assumes almost the clarity of an exact science, and the whole subject is revolutionized. Other chapters of outstanding merit are those on Renal Function Tests, The Modern Treatment of Uræmia, Urinary Calculus, and Retention and Incontinence of Urine. In a volume of this size many details of operative

procedure are necessarily omitted, but the illustrations are numerous and excellent, if somewhat small, and there is a very complete list of references at the end of each chapter.

G. T. G.

Correspondence.

"THE FIRST OPERATION FOR APPENDICITIS."

TO THE EDITOR OF "THE MORNING POST."

SIR,—During the Franco-Prussian War, 1870-71, my father, the late Surgeon-General Manley, V.C., successfully performed the operation for removing the appendix.

Among the "instruments" used were the blade of a shoe-horn, a boot-hook, and a button-hook. This was before the days of antiseptics. The obstruction contained a bent pin.

And the patient recovered!

*Battledown Priors,
Cheltenham.*

(Mrs.) G. F. I. COLQUHOUN.

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Notice.

SOLUSEPTASINE.

MESSRS. MAY AND BAKER are now making available to the medical profession a new colourless anti-streptococcal drug which is soluble in water and suitable for parenteral administration.

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Soluseptasine is for use either alone or in conjunction with Proseptasine. It is intended for the treatment of severe streptococcal infections.

Correction.

GENEVA CONVENTION AND MODERN WARFARE.

COLONEL VONCKEN informs us that the article on the Geneva Convention and Modern Warfare by General Schickele, published in the March number of the Journal, was read at the sixth session of a conference of the members of the International Office for the Documentation of Military Medicine, and not before the members of the International Red Cross and the Permanent Committee, as stated.

EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc.

Correspondence on matters of interest to the Corps, and articles of a non-scientific character, may be accepted for publication under a nom-de-plume.

All Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps" will (unless the Author notifies at the time of submission that he reserves the copyright of the Article to himself) become the property of the Library and Journal Committee, who will exercise full copyright powers concerning such Articles.

A free issue of twenty-five reprints will be made to contributors of Original Communications and of twenty-five excerpts in the case of Lectures, Travels, Clinical and other Notes, and Echoes of the Past.

Reprints or excerpts, additional to the above, can be furnished on payment if specially ordered at the time of submission of the article for publication.

Communications in regard to editorial business should be addressed—"The Editor, JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, War Office, Whitehall, London, S.W. 1."

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Cheques, etc., should be made payable to the "Journal R.A.M.C.," and crossed "Holt & Co."

Each subscriber who pays his subscription direct to the Manager will also receive monthly a copy of "The R.A.M.C., The A.D. Corps, and Q.A.I.M.N.S. *News and Gazette*."

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Journal

OF

THE

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ISSUED



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HIS MAJESTY KING GEORGE VI.

Tradition of Sovereignty.

FOR over eight hundred years the tradition of Sovereignty has existed in England. It has come down to us through the centuries deepened and strengthened until in 1937, most materialistic of ages, the bond between the people and their King is something which holds together, as could nothing else, this vast scattered Empire of Britain. In a country where every man is free and every man is an individual, and where its sons go out to the ends of the earth keeping that Empire, there is one focal point of loyalty and devotion. This was never made more manifest than on August 4, 1914. It had become known that the ultimatum to Germany expired at midnight, and as the time wore on Londoners, silently, instinctively, with one accord, began to make their way to one point of convergence—the Palace gates. To some there was a dim sense of what lay in the years ahead; there was a deep disquietude; an overwhelming anxiety; and an undercurrent of high endeavour. A national crisis—and Londoners came to the home of their King. They were drawn by a force outside their consciousness, and, drawn by that same force, the King and his Queen came to their people on that famous balcony.

The connecting threads, invisible, strong with the strength of centuries, stretched over the sea of upturned faces in the Mall out to the furthest corners of the Empire.

There was a different crowd on Armistice night; there was a cheering, joyous crowd on Jubilee night; but in national tragedy or jubilation Londoners' point of convergence is the Palace gates. It is the one place in this chaotic modern world where all classes and parties are submerged in one common whole, and that whole is made up of loyalty, devotion, and a real personal affection which is based on mutual understanding and respect. The King, in his Majesty, shoulders the biggest responsibility mortal man may take, and his reward is the loyalty and devotion of his peoples.

So, on May 12, the State Coach leaves Buckingham Palace with yet another English King on his way to his crowning, and old grey London is gay with flowers and gay with flags, its streets lined with cheering crowds waving their messages of good will. The Coronation Service is one of our oldest ceremonies, a solemn service of consecration of the King and his Queen to God and their Country. They come out to their people anointed and crowned and surrounded by the pageantry of procession—the scarlet, gold and blue of the troops, a glittering concourse of foreign Royalties and Diplomats, Peers and Peeresses. And as a perfect background the soft greyness of London which has been the home of England's Kings for over eight hundred years.

The Tower of London was the first Royal Residence, built by William I as a fortress to overawe the city he had conquered. Originally there was one narrow door which one man could defend, and the rooms were parted by walls never less than ten feet thick. William built the White Tower, the first St. Peter's Church and the Hall (or Jewel) Tower. All our Sovereigns, from William I to James I, lived here at one time or another, a palace, a fortress, a prison, now a barrack and show-place containing as much history as any museum in England. Of the old Palace in Whitehall where the Court moved about the reign of Henry VIII there is nothing left except the Banqueting Hall, to-day the Royal United Service Museum. The outbreak of the Civil War prevented the completion of the wonderful plan of Inigo Jones for a palace which would have occupied a site of twenty-four acres extending from the river to St. James's Park. Henry VIII built St. James's Palace on the site of the old leper hospital, dedicated to St. James the Less, but there is nothing left of Henry's building save the Gateway facing St. James's Street, the Presence Chamber and the Chapel Royal. The old Palace is said to have been designed by Holbein. Kensington Palace was bought by William III, who very much preferred it for its "suburban seclusion," from the Earl of Nottingham for £20,000. Christopher Wren enlarged the Palace and also built the Orangery for Queen Anne. The stately gardens were laid out Dutch fashion, with formal paths and flower beds at right angles. The last monarch to live here was George II, who died at breakfast in October, 1760.

On May 24, 1819, at Kensington Palace, was born to the then Duke and Duchess of Kent a baby daughter, christened in the Grand Saloon of the Palace, Alexandrine Victoria; in 1837 was brought to the young girl the news of the death of William IV, and the next morning 18-year old Queen Victoria met the Council and started the reign of one of England's most famous Queens.

It was Queen Victoria's decision which saved Buckingham Palace.

George III had bought Buckingham House from the Duke of Buckingham for Queen Charlotte to replace Somerset House, but three times its fate as a Royal Residence was nearly sealed ; George IV hesitated between Carlton House and Buckingham Palace on his accession, and when he died the building was nearly put on the market. When the Houses of Parliament were burnt down in 1835, William IV offered the Palace to the Government to replace them. But three months after her accession Queen Victoria, with characteristic decision, marched into the huge tenantless house and installed herself there, setting upon it the sign and seal of the Court.

Now it is to “ our Court of St. James’s ” that foreign Ambassadors and Ministers are always accredited, but it is to Buckingham Palace that the British people always come as the Home of their King and Queen—and a symbol of something deeper.

**Authors are alone responsible for the statements
made and the opinions expressed in their papers.**

Journal of the Royal Army Medical Corps.

Original Communications.

THE EXPERIMENT ON SUB-STANDARD RECRUITS.

BY CAPTAIN P. J. L. CAPON,
Royal Army Medical Corps.

IN recent years there has been a considerable decrease in the number of men coming forward for enlistment into the regular Army; so much has this been the case that it was considered necessary to institute inquiries into the possibility of making better use of those volunteering for service. Two lines of investigation were pursued:—

(1) The possibility of reducing the present physical standards without loss of efficiency.

(2) The advisability of establishing a "reconditioning" camp or depot into which men suffering from the results of faulty nutrition or minor defects curable by remedial physical exercises could be received and brought up to standard by graduated training and good environment.

Our Army is a small one recruited to serve in all parts of the Empire under trying climatic conditions, exposed to infection by tropical diseases, and must in addition be ready for active service in very inhospitable parts of the world where sickness and climatic hardships are more dangerous than any probable enemy. These circumstances call for a higher degree of general physical efficiency than is required in an Army whose function is to operate in its own continent. Accordingly, it was considered that our standards of general physical fitness could not be altered.

At the same time the progressive introduction of mechanization and specialization throughout the various arms of the Service permitted the

enlistment of men with certain localized defects, affecting function rather than general health, for employment in particular units. To take a simple instance, it is clear that a man enlisted to drive a mechanical vehicle does not need the same degree of physical efficiency of the feet as an infantryman. On these lines, then, our standards have been modified.

The knowledge of the satisfactory manner in which the ordinary recruit developed while undergoing normal training in the depot, encouraged the hope that it would be possible to raise a proportion at least of those men now rejected as under weight or under chest measurement to the standard demanded by putting them through a modified course of training under skilled instructors, and providing them with a diet designed to aid in producing the desired result.

Accordingly, thirty-three men were enlisted and assembled at the Army School of Physical Training on September 25, 1936. All were townsmen, and their ages given on enlistment varied from 18 to 20 years. All were subjected to a careful scrutiny for deformities, etc.

PHYSIQUE OF THE RECRUITS.

The general physique of the recruits was poor. All gave the impression of under-nourishment and lack of fresh air and exercise. Only one—incidentally of the best physique—had played games to any extent prior to enlistment.

The following were the causes of rejection :—

(i)	Under weight	..	..	..	..	6
(ii)	Under chest measurement	..	..	..	..	4
(iii)	Under weight and chest measurement	..	..	..	..	16
(iv)	Under height	..	..	..	..	2
(v)	Disordered action of the heart	..	..	..	..	1
(vi)	Genu valgum	..	..	..	..	1
(vii)	Hallux rigidus	..	..	..	..	1
(viii)	Hallux valgus	..	..	..	..	1
(ix)	Scoliosis	..	..	..	..	1

Stiffness of the joints was very marked, the most pronounced being of the back and shoulders. Shortness of the hamstrings was also very apparent.

Dental inspection and treatment were carried out and the results were rather surprising. Conservations were required for 87, or 2·8 per man, and extractions for 41 or 1·3 per man.

Oral Hygiene was good in 16 ; fair in 9 ; neglected in 6.

These figures are rather remarkable in that they indicate a very much higher standard than is usual.

The average for recruits in the Aldershot Command last year was :—

Conservations	..	..	..	..	6·1 per man.
Extractions	..	..	..	..	1·3 per man.

The following measurements and tests were carried out :—

- (1) Height.
- (2) Weight.

- (3) Exercise tolerance.
- (4) Grip with dynamometer.
- (5) Reaction time.
- (6) Co-ordination by target—dotting test and modified Horsley test.
- (7) Vital capacity.
- (8) Blood-count and hæmoglobin index.
- (9) Foot prints in those with low plantar arches.
- (10) Lower chest measurement, i.e. a hand's breadth below the nipple.

A lesson was learnt at once on the advisability of omitting vaccination until the three months' course was over, as quite half the squad were out of action for varying periods during the first twenty-eight days.

The daily routine is shown in the following time table :—

7.0 a.m.	Breakfast.
8.15 to 9.15 a.m.	Education.
10 to 11 a.m.	Physical Education.
11.15 to 12.30 p.m.	Recreational training and instruction in the technique of soccer, hockey, athletics, boxing and swimming.
1 p.m.	Dinner.
2.30 to 4 p.m.	Education.
4 p.m.	Tea.
5 to 6 p.m.	Physical education and where necessary remedial exercises,
7 p.m.	Supper.

On Wednesday and Saturday afternoons organized games were played, and on Sunday a long walk was taken.

THE INSTRUCTORS.

The instructors were carefully picked men considered especially suitable for this work. In charge was a Sergeant-Major Instructor of the Army Physical Training Staff and three Assistant Instructors.

EXERCISES.

These cover the ordinary exercises as given in the Tables for Recruits of the Regular Army.

The general plan is the division into eight tables numbered from 1 to 8. Each table contains similar groups of exercises, starting with the Introductory Group using all the muscles of the body in a mild way, such as walking, hopping and skip-jumps. This gives the body a chance to warm up and get into trim for the harder exercises to follow.

Then follow harder exercises devoted to special muscle groups such as

abdominal, dorsal and heaving exercises, concluding with final exercises which allow the body to cool off. A breathing exercise is introduced at the conclusion of the Introductory Group, and again in the Final Group, while deep breathing is taught with all suitable exercises.

Table 1 contains the easiest exercises in each group and progression is maintained in each case up to Table 8.

For the recruits special recreational training of a quickening type was introduced of which the following are examples.

Co-ordination and Mental Alertness:—

(a) Bouncing, throwing and catching a tennis ball.

- (1) Against a wall, both stationary and on the move.
- (2) From one to the other ten yards apart, single and double ball.
- (3) In fours, single and double ball.

(b) *Games.*

- | | |
|---|----------------|
| (1) Bouncing ball relay race. | } Tennis ball. |
| (2) Rolling ball relay race. | |
| (3) Rounders. | } Football. |
| (4) Rugger passing on the move. | |
| (5) Circle jump ball. | |
| (6) Circle dodge ball. | |
| (7) Circle touch ball. | |
| (8) Tunnel ball relay. | |
| (9) Pass ball. | |
| (10) Dribbling in file (teams of six). | |
| (11) Any competitive team games where fifty per cent of the class are employed at one time. | |

Relay races, walking, running, hopping, etc.

DIET.

The diet consisted of the ordinary food given to the students of the School, which is of the same quality and quantity as that supplied to the rest of the Army, but the cooking is rather above the average. It was supplemented by such articles as milk, butter instead of margarine, fruits and fresh salad. Supper of substantial nature was also provided.

Each man received about 4,738 calories daily, while the total protein amounted to approximately 137 grammes per day of which about 55 per cent was animal protein.

The total fat amounted to about 166 grammes per day of which approximately 90 per cent was animal fat. Each man received just over $\frac{1}{4}$ pint of fresh milk daily in addition to the normal milk ration of 4.5 ounces.

My own feeling is that the diet and the physical exercise were complementary, and that one without the other would not have produced the final result. Had the food alone been supplied without the exercise it seems very doubtful if any result beyond increase in weight would have been

achieved. Again physical exercise without the increased diet would probably have produced little good, possibly harm ; on enlistment the majority were " wiry " enough but had little covering.

Unfortunately it was impossible to run a " control squad."

GENERAL RESULTS.

Weights were taken weekly, and at the end of the second week a general survey was made to find if any had reached the required physical standard. The following figures were obtained : Previously under weight and/or chest now up to required standard : 10.

In addition, two who had enlisted in the Royal Artillery, the physical standards of which are higher than those for the infantry of the line, had reached the required standard for infantry.

Two men, one suffering from hallux rigidus of both feet, and one from disordered action of the heart, would in my opinion be fit for enlistment.

At the end of the fourth week of training another survey was made of the squad to assess their progress.

It was found that nineteen had reached the required physical standard, that is, speaking generally, these men had increased in weight and chest girth to the required minimum at least and in some cases above it.

The average gain in weight had been 5·9 pounds while the average increase in expanded chest measurement was 0·7 inch. The largest individual increase in weight was 11 pounds and the largest individual increase in expanded chest measurement was 2 inches.

As regards the minor deformities noticed on enlistment the great majority had improved, while in the case of lateral spinal curvatures many had disappeared completely.

There still remained nine men who were 1 to 2 pounds under weight or half an inch under chest measurement, that is just below the physical standards, while four remained well below, that is up to 9 pounds under weight and in one case three-quarters of an inch under chest measurement.

This was a very striking result : that out of 33 men (of whom one had been in hospital with severe vaccinia) 19 had reached the required standard while 9 more were within a few pounds of it. In addition the squad was much more alert, co-ordinated and balanced. They were beginning to show muscle where none was apparent before. The deformities were improving, due, I think, to the beneficial effect of general physical training as well as to the remedial work carried out.

At the end of the sixth week it was found that 21 men had reached the standard, while 6 more were just below (one to two pounds). Of the remaining six men still well below standard, one was in hospital with a fracture around the sacro-iliac joint and the other five were 9 pounds below weight, two still required half an inch on the expanded chest measurements. The deformities had improved very much and, with the exception of a case of hallux valgus and a case of genu valgum, could be said to have disappeared.

TABLE.

Name	Age	Trade	Height	Weight		Expanded chest		Exercise tolerance		Vital capacity		Physical defects			
				Enlisted	Final	Enlisted	Final	Enlisted	Final	Enlisted-d	Final				
BAT.	18	Messenger	65½ in.	109 lb.	121 lb.	32½ in.	34½ in.	70	84	60	68	94	64	3,500 c.c.	6 lb. under weight
CA.	18	Carriage cleaner	65½ "	124 "	131 "	36 "	36½ "	74	98	64	76	96	64	3,900 "	1 in. under chest
CH.	20	Machinist	62½ "	109 "	111 "	33½ "	33½ "	110	132	102	112	134	98	2,750 "	Hæmox rigidus R. and L.
CO.	18	Driver's mate	63½ "	107 "	119 "	33 "	34 "	72	100	64	84	112	76	3,100 "	6 lb. under weight
EN.	18	Plumber's mate	61½ "	105 "	116 "	32½ "	34½ "	84	100	82	100	100	84	2,950 "	7 lb. under weight
EVA.	19	Groom	65½ "	117 "	129 "	33 "	34½ "	80	96	72	68	82	60	3,200 "	½ in. under chest
EVJ.	18	Porter	62 "	100 "	105 "	33 "	33½ "	96	124	96	80	104	60	2,500 "	1 in. under weight
F.	18	Tiler's mate	70½ "	124 "	137 "	33 "	34½ "	80	100	64	72	100	62	3,700 "	1 in. under chest
GE.	20	Porter	64½ "	113 "	123 "	35 "	35½ "	108	124	74	80	116	60	3,450 "	2 lb. under weight
HAN.	19	Butcher	63 "	106 "	112 "	33 "	33½ "	72	116	66	72	108	60	2,650 "	8 lb. under weight
HOP.	19	Painter	68½ "	114 "	118 "	34 "	34½ "	80	104	72	104	124	90	4,100 "	½ in. under chest
HOR.	18	Labourer	64 "	105 "	118 "	32½ "	33 "	72	96	68	Sick			2,500 "	6 lb. under weight
J.	18	Porter	65½ "	111 "	117 "	32 "	34 "	92	112	80	78	84	64	3,500 "	7 lb. under weight
M.	18	Weight checker	65½ "	108 "	119 "	32½ "	34½ "	96	132	96	88	128	73	2,300 "	½ in. under chest
MIL.	18	Labourer	63½ "	109 "	119 "	34 "	35½ "	82	102	70	60	84	52	3,550 "	4 lb. under weight
MOR.	18	Window cleaner	70½ "	116 "	130 "	36 "	36½ "	88	120	80	84	124	62	4,000 "	4 lb. under chest
O.	18	Messenger	62 "	109 "	117 "	33½ "	34 "	96	128	88	76	96	68	2,850 "	7 lb. under weight
P.E.	20	Rubber cutter	66 "	112 "	122 "	33½ "	35½ "	88	120	92	88	112	80	3,250 "	1 in. under chest
SHA.	18	Sawyer	66 "	124½ "	139 "	35½ "	35½ "	86	112	68	84	116	64	3,650 "	3 lb. under weight
SHE.	19	Labourer	62½ "	107 "	113 "	32½ "	33½ "	96	120	86	80	100	68	2,650 "	8 lb. under weight
T.	18	Grocer	63½ "	119 "	121 "	36 "	36 "	72	84	62	90	96	64	3,750 "	½ in. under chest
WI.	18	Miner	62½ "	100 "	112 "	33 "	34 "	104	124	88	100	112	50	2,750 "	7 lb. under weight
														3,250 "	1 in. under chest
														3,750 "	12 lb. under weight

Blood-counts showed as follows:—

Hæmoglobin	..	90 to 100 per cent.
Red blood cells	..	4,200,000 to 6,900,000 per c.mm.
Colour-index	..	0.8 to 1.1
White blood cells	..	4,200 to 16,000 per c.mm.

The average gain in weight since joining was 6·5 pounds, while the greatest individual gain was 12 pounds.

The average gain in expanded chest measurement was one inch, and the greatest individual gain in expanded chest measurement was two inches.

A difficulty now became apparent in that those who had gained the necessary weight generally went on gaining weight, while the two classes of "just below" and "well below" hung fire. It was realized that these were the obstinate cases, and the most difficult part of the experiment was still to come, i.e. to get up to standard those who were still below.

At the ninth week two more had reached the required standard of weight making 23 men fit, while 5 men were 1 to 2 pounds under. The average increase in weight was $1\frac{1}{2}$ pounds for the week.

The final tests by the Medical Board showed :—

24 men fit and up to standard.

6 men on the border-line and likely to become fit during training at their Depot.

2 men unfit and not up to physical standard (one rejected on account of his eyesight).

1 man unfit due to injury, subsequently accepted.

An analysis of the weekly records of weight shows that all recruits improved rapidly during the first four weeks of the course, but that from this time onwards while the majority continued to gain weight, though at a slower rate, some remained stationary or even lost weight.

All those who continued to gain weight eventually attained the minimum standard, even though one was as much as thirteen pounds below that standard on enlistment.

Those members of the group that ceased to gain weight after the fourth week were carefully examined, but no underlying cause of their failure could be detected.

The preceding table gives the particulars of some of the men before and after training.

SICKNESS.

There was little sickness among the squad. The chief cause was vaccinia in the first few weeks ; but after that had settled down there was nothing of interest, only an occasional cold. One striking thing was the freedom from injury, especially as the general performance was clumsy at first.

It may be worth noting that these men from the first took a tremendous interest in their development. The weekly weight measurements were events in their lives, and they began to take a pride in their bodies.

Several of them after week-end leave said that their friends and relations remarked that they had "never looked so well."

The following men were noted to have the defects shown against their names with the results achieved after eleven weeks' training.

Name	Minor physical defects	Final
AL.	Low arches. Slight hallux rigidus	} With the exception of hallux valgus, all much improved
AN.	Low arches. Left scoliosis (dorsal)	
BAR.	Slight hallux rigidus R. and L.	
BAT.	Low arches. Slight scoliosis (lumbar)	
CA.	Hallux rigidus R. and L.	
CH.	Hallux valgus R. and L. L. shoulder dropped	
D.	Slight genu valgum	
ENA.	Slight hallux rigidus R. and L. Slight genu valgum	
EVJ.	Scoliosis (dorsal)	
F.	Slight hallux rigidus R. and L. Slight scoliosis (dorsal). R. scapula winged	
GR.	Scoliosis (dorsal)	
HAL.	Scoliosis (dorsal)	
HOP.	Scoliosis (dorsal)	
HOR.	Kyphosis (dorsal). Lordosis	
J.	Low arches. Very stiff shoulders	
MA.	Scoliosis (dorsal)	} Much improved
MI.	Scoliosis (dorsal). Round shoulders	
MOS.	Winged scapulæ	
O.	Round shoulders	
PE.	Marked kyphosis. Low arch R. foot	
PR.	Slight lordosis	
SE.	Winged scapulæ	
SHA.	Slight round shoulders. Hallux rigidus R. Very wide feet	
SHE.	Slight winged scapulæ	
WI.	Slight scoliosis. Round shoulders	

FINAL RESULTS.

Medical Tests : Average per head.

Age : 18½ years.

Height : 5 ft. 4½ in.

Weight : On joining ... 109.75 lb.

Final ... 117.75 lb.

Exercise Tolerance Test : On joining ... 88 110 78.

Final ... 84 103 77.

Reaction Time : On joining : Auditory ... 0.26 sec.

Visual ... 0.36 sec.

Final : Auditory ... 0.25 sec.

Visual ... 0.34 sec.

These figures are to be regarded as relative, not absolute.

Grip : On joining : R. 31 kilos. L. 30 kilos.

Final : R. 34 „ L. 31½ „

Co-ordination : Target dotting : On joining ... 56.9 per cent.

Final ... 58 „ „

Modified Horsley : On joining ... 1.9

Final ... 1.5

Vital Capacity :	On joining	...	3,120 c.c.
	Final	...	3,430 c.c.
Expanded Chest :	On joining	...	33·3 in.
	Final	...	35·0 in.

COMPARISON OF WEIGHT GAINED BY SUB-STANDARD RECRUITS SINCE ENLISTMENT.

	1st-4th week	6th week	8th week	11th week
Those reaching standard ..	5·2 lb.	7·0 lb.	7·6 lb.	8·1 lb.
Those not reaching standard	3·5 „	3·0 „	3·0 „	4·0 „

For ordinary recruits of the Southern Command, weight increases work out as follows :—

4th week	8th week	12th week
6·13 lb.	7·87 lb.	9·24 lb.

This rather suggests that the bigger frame of the normal recruit can add weight more easily.

The results of this experiment are encouraging. Out of 33 men, 24 were made fit in three months. It is true one of the 33 was in hospital for seven weeks with a fracture of the sacrum, and was up to physical measurements but incapacitated because of his injury. He was subsequently found fit.

The causes of the failure to develop nine of the men are difficult to assess. They might have been :—

(1) *Physical Disease or Injury.*

This can be dismissed at once, as the sick-rate was very low—2·1 per cent new cases daily including many cases of vaccinia at the beginning of the Course.

(2) *Age and Physique of Recruits.*

Several were not yet 18 years of age, and it is possible that one was trying to build up too much on a body that was not yet ready to receive it. The physique of the squad was poor naturally, and if the foundation is poor the house cannot be imposing.

(3) *The Exercises and the Instructors.*

Both exercises and instructors have been proved by experience to be sound. Large numbers of soldiers have been trained in this way as recruits with great success.

(4) *Diet.*

The diet has been satisfactory, I think, as it was ample in quantity and very good in quality.

This throws us back on the old theory of “fat and lean kine” and it will be interesting to see the result of a further three months training on

the six border-line cases who are being kept under special observation for this period.

CONCLUSION.

(1) Young men can be made fit quite easily if the necessary facilities are available. It should be possible from an Army point of view to give after six weeks an estimate of those likely to benefit.

(2) This work should be taken in hand without delay and applied to the post-school age (14 to 18 years) immediately. The physical conditions seem to deteriorate, especially after the child leaves the active school conditions and obtains work. Time or opportunity for physical exercise is reduced or absent and the payment of wages being still a novelty, leads possibly to undue indulgence in cinemas and cigarettes.

My own feeling is that one cannot urge too strongly on those having any authority over such work the necessity of making physical training attractive to young men. The medical profession can, I think, help in this considerably, as physical training is, after all, a branch of medical science—the science of keeping the body fit.

(3) Most of the postural deformities disappear, or, at any rate, improve with strengthening of the muscles, and given carefully applied remedial work, not necessarily of a difficult or advanced nature, much may be done, especially in the scoliosis cases, to improve their condition.

(4) Working conditions must be favourable. This includes good instructors who can get the best out of the class—leaders who can carry their enthusiasm over to their men, not by shouting and “barrack square” methods, which incidentally are severely discouraged in the Army School of Physical Training but by interesting the class and showing them the benefits of a healthy body.

As regards working dress and place, all work should be done in the open air as far as possible: if in the gymnasium, as unfortunately was usually the case in this experiment, with all windows open and the men stripped to the waist and without shoes until jumping and running commence.

(5) The value of breathing exercises in increasing the vital capacity is subject to discussion. The value of a large vital capacity is questioned by some observers. The German school, for example, believe that vital capacity should be allowed to develop along normal lines by games and conditioning, especially cross-country running, and they do not stress the value of a large vital capacity on endurance.

It would seem, in theory at any rate, that other things being equal, a large vital capacity should produce better results in an endurance test than a small vital capacity, but the “other things” are difficult to equate, and at the moment the theory is not proven.

The numbers involved in this trial are small, but the results do suggest that much may be done even in the short period these youths were under observation to counteract the effects of previous malnutrition, using the

term in its widest sense to include both faulty environment and an inadequate or unbalanced dietary.

The accompanying photographs give some idea of the development of some of the recruits.

Series A shows individuals on arrival, and series B after 11 weeks' training.

NOTE : The sequence of each individual series is downwards.

A



B



Major-General H. H. A. Emerson, D.S.O., Director of Hygiene.

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I am indebted to the following officers for permission to publish this article :—

Lieutenant-General Sir J. Hartigan, K.C.B., Director-General, Army Medical Services.

A



B



GENITAL WARTS.

BY LIEUTENANT J. F. WILSON,
Royal Army Medical Corps.

(Continued from p. 238.)

FILTRATION.

The term "filtrable" is no longer strictly applicable to the viruses as Elford (1931 [20]) has measured the sizes of the various viruses by filtration through graded collodion membranes. The filtrability, therefore, depends entirely on the size of the filter. The Berkefeld N filter is not even a rough guide, for leptospira and the organism of bovine pleuropneumonia will pass through it.

For this reason and because it was a long, difficult procedure requiring a considerable amount of apparatus, it was dispensed with during most of the experiments. In order that the technique might be learned, a vaccine and control vaccine were prepared.

Method.—The warts were obtained from a young pregnant female who had a very marked infection. The patient had neither gonorrhœa nor syphilis. From her history it was evident that she had every opportunity of acquiring the warts by direct infection.

The mass of warts was cleaned with spirit and a portion of the growth removed with a knife, a local anæsthetic being used (1 per cent percarine). The portion removed was free from normal skin.

The tissue was kept in a sterile test tube till one and a half hours later when it was ground in a sterile mortar and extracted with 50 per cent glycerine in normal saline. It remained in the glycerine for twelve hours at -4°C .

Sterile saline, to about ten times the volume of the original piece of tissue, was added and the whole shaken for one hour in a mechanical shaker.

This was then filtered through a Berkefeld N filter. As only a small quantity of fluid was being used, a sterile test tube was inverted over the candle in order to increase the surface of fluid in contact with the filter and so prevent waste and shorten the time required. Suction was also applied. After filtration was complete, the residue was restored to its original volume by the addition of sterile normal saline, shaken again in the mechanical shaker and filtered.

The two filtrates were mixed.

A blood-agar plate and anaerobic tube of bullock heart medium were inoculated with loopfuls of the filtrate. These were incubated and examined after twelve, twenty-four and thirty-six hours but no growth resulted.

The remainder of the filtrate was divided into two equal parts of approximately five cubic centimetres each. One part, the vaccine, was heated to 60° C. for one hour. This was done to kill any organisms, virus or bacterial, that might be present. The other part was autoclaved for fifteen minutes and constituted the control.

The vaccine and control fluid were placed in sterile vaccine bottles.

IMMUNITY REACTION.

All warts are liable to disappear spontaneously; this is the probable explanation of the "charming" of warts; in addition some people fail to react when inoculated with warts. Findlay [1] found that he became immune after he had been inoculated with three crops of warts.

It therefore seems as though there was some immunity reaction. The vaccine was used to test for a skin reaction in patients both with and without genital warts. No attempt at treatment was made.

Seven cases were tested with the vaccine.

Case 1.—The female from whom the warts were removed.

Case 2.—A male with acute gonorrhœa and genital warts.

Cases 3 to 5.—Males with acute gonorrhœa. None had had warts of any kind at any time.

Cases 6 and 7.—Males with syphilis. One had a common wart on the hand, the other had never had warts.

The same technique was used in each case. 0·05 cubic centimetre of the vaccine was injected intracutaneously into the left arm and 0·05 cubic centimetre of the control vaccine was injected intracutaneously into the right arm.

The cases were examined at intervals of six hours.

After twenty-four hours, Case 2 showed a slight redness on both arms, the redness on the left arm being slightly more marked than that on the right. The reaction faded after six hours.

None of the other cases showed any reaction.

The test was repeated in each case but none showed any reaction.

INTRACEREBRAL INOCULATION.

Goodman and Greenwood [10] report in detail a series of experiments carried out by Dienes and Kubik. Eight guinea-pigs were inoculated intracerebrally with ground-up wart material. The results obtained were entirely negative. The technique used was based on this work.

It was decided to repeat this experiment using mice and rabbits. Mice are generally unsatisfactory animals as any trauma to the brain tends to cause the localization there of a Gram-negative bacillus. This leads to the production of cerebral symptoms and death of the animal. Both rabbits and mice [20] may also be infected by a virus independent of any experimental infection. A further point of importance is that a few hours after

death the brain of a mouse becomes soft and useless for histological purposes.

Method.—The material was obtained from a case of profuse genital warts in a female who had neither syphilis nor gonorrhœa. The patient was given a general anæsthetic, the warts were cleaned with spirit, removed with an electric cautery and placed in a sterile bottle.

Half of the material was stored in 50 per cent glycerine in water and placed in the ice chest. (The glycerine used in all the experiments was chemically pure. This is important as some of the ordinary commercial glycerine may contain arsenic or other contaminant.)

The other half was ground in a sterile mortar and extracted with a sterile isotonic saline solution. The suspension obtained was centrifuged. The clear supernatant fluid was pipetted off and placed in a sterile vaccine bottle.

A blood agar plate and an anaerobic tube of bullock's heart medium were inoculated. A growth (five colonies of *Staphylococcus albus*) was obtained on the blood-agar plate. No anaerobic growth was observed. The suspension probably became contaminated during the process of grinding as it is very difficult to prevent dust and secretion droplets from entering the mortar. As a heavy inoculation had been made on the blood-agar, it was decided that the organisms present would not affect the experiment.

A portion of the extract was autoclaved for injection into control mice.

The method of injection was similar for both rabbits and mice. The fur was clipped short over the rabbit's head, the animal was anæsthetized with ether, the skin was sterilized with spirit and a weak solution of iodine, and the wart extract was injected into the brain with an ordinary record syringe fitted with a sharp needle.

The point used for injection in the rabbit was on a line joining the posterior commissure of the eyes about one centimetre from the mid-line of the head. For the mice a point was chosen slightly to one side of the mid-point of a line joining the ears.

Series I.

Six mice (Nos. 1 to 6) received 0·2 cubic centimetre of the wart extract and three control mice (Nos. 7 to 9) received 0·2 cubic centimetre of the autoclaved extract.

Passage of Brain No. 3A.—Half of the brain from mouse 5 was ground in a sterile mortar and extracted with isotonic saline solution. Aerobic and anaerobic cultures gave no growth.

Three mice were injected as before with 0·2 cubic centimetre of this extract.

Histological Examination of the Brains.—None of the brains showed any lesion that could not be described as due to trauma or pyogenic

infection. There were no signs that in any way suggested a virus disease; there were no inclusions, and any peri-arterial infiltration that was present consisted mainly of polymorphs.

TEST MICE.

Mouse No.	Died	Brain No.	Notes
1 and 2 }	Within 48 hours	—	Both discarded
3	At 38 hours	1A	Removed at once. Fixed in Helley's fluid
4	At 7 days	2A	The brain was covered with pus containing a Gram-negative bacillus. Fixed in Helley's fluid
5	At 13 days	3A	Just before death it was very sluggish but there was no hypersensitivity nor inco-ordination. Killed with ether. Half the brain fixed in Helley's fluid. <i>Half passaged</i>
6	Was alive after 21 days	—	—

CONTROL MICE.

Mouse No.	Died	Brain No.	Notes
7 8 9 }	None showed any ill-effects	4A	One was killed at 13 days as a control mouse No. 5. The brain was fixed in Helley's fluid

TEST MICE.

Mouse No.	Died	Notes
10	Within 48 hours	Discarded
11 and 12 }	—	Showed no symptoms at any time

Series II.

Two young rabbits each received two cubic centimetres of the extract intracerebrally. Neither showed any effect of the injections at any time.

From these experiments it does not appear that the intracerebral inoculation of guinea-pigs, mice or rabbits is of any value as a method for demonstrating the virus.

INTRADERMAL INJECTION.

The wart extract prepared for the first intracerebral series was used.

The fur was shaved from the back of an old rabbit and the skin was sterilized.

0.2 and 0.4 cubic centimetre of the extract were injected intracutaneously and 0.5 cubic centimetre was injected subcutaneously into the right side of the back. Similar quantities of the autoclaved extract were injected into the left side of the back.

The animal was observed frequently, but nothing abnormal was seen.

INTRATESTICULAR INJECTION.

The material used was the same as that taken for the intracerebral injections. The wart tissue was kept in 50 per cent glycerine for ten days at -4°C . It was washed in sterile saline solution and ground in a sterile mortar. The ground-up tissue was extracted with sterile saline and centrifuged. The clear supernatant fluid was removed with a pipette. Culture media were inoculated but no aerobic or anaerobic growth resulted.

0.5 cubic centimetre of the extract was injected into the body of the testis of a young rabbit. An intense reaction took place in two days. The testis was enlarged to about three times its normal size. After twelve hours it was only about one and a half times the normal size and it remained in this state till it was removed six hours later. The other testis showed no reaction.

Half of the testis was fixed in Helley's fluid (Testis No. 1). The other half was ground in a mortar, extracted, centrifuged and cultured as before. The clear extract was injected into the brains of three mice and the testis of another young rabbit (Testis No. 2).

TEST MICE.

Mouse No.	Died	Notes
13	After 6 days	Brain too soft for histological examination
14 and 15 }	—	Showed no reaction

Testis No. 2 showed no reaction to the naked eye and was removed nine days later. Half was fixed in susa for histological examination and an extract was prepared from the other half for the inoculation of eggs (see "Virus Culture").

Histological Examination of Testes.

Testis No. 1.—The whole of the stroma showed great change. The tubules were degenerated and in places had been replaced by necrosing cells and leucocytes.

The interstitial tissue was increased and contained large numbers of small round cells and cells (which were probably eosinophil leucocytes) packed full of eosinophil granules. Many of the cells of the tubules and

interstitial tissue had the same vacuolated appearance of their cytoplasm, which was noted in the prickle-cell layer of the wart tissue, and contained spherical eosinophil granules. These granules varied greatly in size and were both smaller and larger than the granules in the blood-cells which were all of approximately the same size. A few were as large as those seen in the wart tissue and seemed to contain smaller granules. The nuclei, most having blue nucleoli, also contained eosinophil granules which varied in size but were usually very small.

Sections stained Gram showed no organisms.

Testis No. 2.—The tubules and interstitial tissue appeared normal. A very few eosinophil leucocytes were present and a few of the cells contained fairly large eosinophil "inclusions." These cells were mainly situated in the basal layers of the tubules.

The reaction obtained in the first testis was very marked, but before any conclusion can be drawn from this the experiment would have to be repeated and controls carried out with normal skin tissue. There was no means of determining whether the eosinophil "inclusions" were degeneration products due to an anaphylactic type of reaction or the products of a virus infection. This may possibly prove a useful method of demonstrating the virus.

VIRUS CULTURE.

Eggs, that had been incubated for ten days, had been found suitable for the growth of various viruses. This was attempted. It proved expensive to buy eggs which had already been incubated for ten days and there were the additional difficulties of transportation of eggs at this stage and of the unreliability of the sources of supply. The methods of incubation were seen at a large poultry farm and proved to be quite simple.

Accordingly freshly laid, fertile eggs were bought at the market price. These can be kept for some weeks before incubation and are easily transported in the ordinary egg box. Ten days before they were required, they were placed in the laboratory 38° C. incubator. Small cardboard boxes with a little cotton-wool were used for holding them. In the morning and at night they were turned over. This can be done quickly if one side is marked with a × and the other with a —. No other attention was required.

The simplest possible method of inoculation was adopted as it was thought that the more complicated methods [22] were more likely to lead to contamination. The egg was candled and the outline of the air sac and a thin piece of the shell, about half-way between the two poles, were marked with pencil. These two areas were sterilized with spirit, then with iodine. The blade of a pair of scissors, with a sharp point, was sterilized by heat. A hole was made over the air sac by means of a sharp tap with the point of the scissors and then another was made in a similar manner through the thin piece of shell marked. This opening was enlarged by chipping away the shell till a sterile pipette could be inserted into the

artificial air sac produced by this means. After the egg had been inoculated through the pipette, the small hole over the air sac was sealed with a drop of paraffin wax and the larger one with an oval piece of thin paper dipped in paraffin wax. The paper will lie flat if a few small radial incisions are made in it. The eggs were then incubated for a further four days.

The egg was opened with aseptic precautions and plates inoculated from the surface of the chorio-allantoic membrane. If a histological examination was to be made the membrane was stretched over a small cardboard frame and fixed in susa.

Series I.

Six eggs were inoculated with the saline extract from Testis No. 2 (eggs 1 to 6).

Two control eggs were inoculated with the same extract which had been boiled for fifteen minutes (eggs 7 and 8).

After 4 days. Eggs Nos. 1, 2 and 3: The membranes were opaque. The membranes (1, 2 and 3) were fixed in susa for histological examination.

Eggs Nos. 4 and 5: The membranes were opaque. Smears were made from these.

Egg No. 6 was bad.

Controls.—Egg No. 7: The membrane was clear. It was fixed in susa for histological examination.

Egg No. 8 was bad.

Histological Examination.—Membranes Nos. 1, 2 and 3 were similar. The membranes were thickened in all their layers and there was a marked infiltration with leucocytes containing eosinophil granules. Several of the cells of the membrane, not blood-cells, appeared to contain granules which varied in size and were few in number. The leucocytes were packed with granules of approximately the same size.

When measured by the direct method, the average size of the tissue-cell granules was $1.5\ \mu$.

The control membrane No. 7 showed no thickening, no infiltration by eosinophil leucocytes and no eosinophil granules in the cells.

Membranes Nos. 4 and 5: Smears made from these membranes contained erythrocytes, a few leucocytes and cells. There was nothing else of note.

Series II.

Genital warts, which had been removed from the glans penis of a male suffering from gonorrhœa, were placed in 50 per cent glycerine for three weeks. An extract was prepared as before and half was heated to 100°C . for fifteen minutes to act as control.

Unfortunately a profuse growth of *Staphylococcus aureus* and *albus* and *Streptococcus hamolyticus* was obtained from the unheated extract. As a result the five eggs inoculated were all bad and were discarded. The control extract was sterile.

Eggs Nos. 9, 10 and 11 were inoculated with the sterile control extract and were opened after four days. The membranes were clear and were fixed in susa.

Histological Examination.—All the membranes were similar. There was no proliferation of the cells of the membrane, no infiltration by leucocytes and no cell granules could be seen.

Although a reaction was obtained with the extract prepared from Testis No. 1 no conclusions can be drawn, because the controls, with boiled wart and testicular extracts, were not sufficient as many irritants have been found to give misleading results.

The presence of inclusion bodies in the cells was very doubtful and a great many more examples would have to be studied before one could make any definite statement. Granules certainly did appear to be present in cells, which were not blood-cells, and when examined with a good microscope these granules differed in size from those in the eosinophil leucocytes. There was no evidence of similar granules or of the same leucocyte reaction in any of the control membranes; but the whole series of experiments is much too short for consideration of the question whether a culture of the virus had been obtained.

DISCUSSION.

From the clinical and experimental observations it is evident that the lesions under discussion are warts, certainly not gonorrhœal, and not always venereal or moist. Therefore, if the word "wart" requires a descriptive adjective, "genital" is the best one which can be correctly applied. The name *condylomata acuminata* is not satisfactory as it does not indicate the true nature of the condition and tends to cause confusion with the *condylomata lata* or syphilis.

The other point of interest which emerges from the clinical study is the relationship between pregnancy and the size of the warts. In view of the lack of response of the warts in the males to moist discharges, it seems unlikely that increased blood supply and discharge should be the only factors responsible for their change in size in pregnant females. The discovery that œstrin belongs to the group of carcinogenic hydrocarbons suggests a possible explanation. The theory that the increased production of œstrin by the placenta, itself connected with the "invasion" of the uterus and growth of the foetus, causes an increase in the warts is certainly attractive. It also seems more than chance that a diminution in the secretion of œstrin should be followed by a marked decrease in the size of the warts and in some cases even by their complete disappearance.

The whole sequence of events seems to indicate the action of some stimulus to growth during the pregnancy. If œstrin is responsible, it might act as an external irritant due to its secretion in the urine and it would be of interest to observe if there was any change in the rate of growth of any common warts which might be present on some other part of the body. The whole question is, however, entirely theoretical.

The relationship between the different types of warts and the papillomata has been discussed elsewhere [1, 12] and need not be considered here.

Histologically the genital wart is a simple squamous papilloma, and any attempts which have been made to distinguish it from other squamous papillomata appear very artificial. There is little doubt that acidophilic bodies are present in certain of the epithelial cells. It is very unlikely that they are cytoplasmic degeneration products or nuclear extrusions, such as are found in the stratum granulosum from the formation of keratohyaline. The bodies described are all large and contain the refractile granules which serve to differentiate the two at once. In addition the true inclusion bodies are found near the basal or germinal layer at some distance from the stratum granulosum. None of the granules found in the stratum granulosum caused the nucleus to become indented, as the true inclusion bodies did, although they could be found lying surrounded by a clear zone in the cytoplasm.

It appears that the inclusion bodies are in the cytoplasm and that they may increase in size causing the nucleus to become indented. Further the cytoplasm tends to undergo some form of change so that the cell swells up and a clear, vacuolated, cytoplasmic space is found in paraffin sections. This process ultimately produces in the paraffin sections a clear circular space in which the inclusion body and nucleus lie free. A similar vacuolation of the cells has been noticed in the lesions of fowl-pox. It thus seems as though the presence of these inclusion bodies was associated with a definite change in the cell.

If the modern theories about virus diseases are accepted, these changes are produced by the virus which occurs as the so-called elementary bodies which, far from being ultramicroscopic, have been demonstrated clearly in fowl-pox, molluscum contagiosum, and other diseases. These elementary bodies can be seen as small refractile granules in the inclusion body in the conditions mentioned. A very similar picture is present in the warts for even the photomicrographs leave little doubt that the inclusion bodies are packed with granules. This considered in conjunction with the experimental evidence of the infectivity of sterile filtrates suggests that the sections of the warts demonstrate both the virus (elementary bodies) and the virus colony (inclusion body) in the cell; the appearances of these being very similar to those of molluscum contagiosum, fowl-pox, vaccinia and variola.

There is no reason why the virus should not multiply in the nucleus also, but the question of intranuclear inclusions will not be discussed further for the reasons already stated.

Guinea-pigs, mice and rabbits are quite unsuitable for demonstrating the virus by the intracerebral route and there was no skin reaction to the virus. The rabbit's testicle does seem to offer a possible means of demonstrating the virus, but two inoculations carried out without controls is not

sufficient to allow any further consideration at this stage. There are also several disadvantages in this method as the testis reacts to other viruses and the histological picture is difficult to interpret as there are acidophilic bodies normally present in the cytoplasm of the cells of the normal rabbit testis [21]. The reaction in the experiment carried out was so marked, however, that the whole question requires further consideration.

A sterile extract of the reacting testis caused an opacity on the membranes of the developing chick embryo which was not caused by the boiled extract from the warts. Beyond this little can be said as again there are numerous fallacies in this method.

In view of the difficulties which have been experienced in transferring the warts to animals, testicular injection and the growth in eggs are worthy of further investigation as a means of demonstrating the presence of the virus.

CONCLUSIONS.

(1) In view of the previous experimental work and of clinical experience, "Genital Wart" is suggested as a name for the lesion.

(2) The possibility of further study is noted in connexion with the malignant papillomata and the carcinogenic action of oestrin.

(3) Intracytoplasmic, acidophilic inclusion bodies containing granules have been described in genital warts. The similarity between these and the inclusion and elementary bodies of other conditions has been noted.

(4) Possible intranuclear inclusion bodies have also been described.

(5) Cerebral inoculation appears to be of no value as a method of studying the virus which is evidently dermatotropic.

(6) Testicular injection may offer a means of transmitting the virus to rabbits and other animals.

(7) The membranes of the developing chick embryo may be a suitable medium for the growth of the virus.

APPENDIX I.

FIXATION AND STAINING.

Various stains and fixatives were used to determine which gave the most satisfactory results.

A large piece of tissue was obtained from an extensive case of genital warts. This was cut into blocks and fixed in :—

- (1) 95 per cent alcohol.
- (2) Bouin's fluid.
- (3) Corrosive formol.
- (4) 10 per cent formol.
- (5) Zenker's fluid. (Zenker acetic.)
- (6) Helley's fluid. (Zenker formol.)

Helley's fluid was found to be the best and was used throughout.

Most of the stains used are practical modifications of the more classical method.

(1) *Hæmatoxylin and Eosin*.—This stain gave a good general picture but was not used as the cell structure was not sufficiently clear.

(2) *Azan*.—The method is a long one and offers no advantages.

(3) *Kull*.—The prickles are well demonstrated and also the nuclear outline, but it is more difficult to use and offers no advantages over iron hæmatoxylin.

(4) *Iron Hæmatoxylin*.—The nuclei are well shown, but it also stains numerous bodies in the epithelial tissue. It is almost impossible to differentiate these as there are no contrasting colours.

(5) *Romanowsky Stains* (Jenner, Giemsa, Leishman and Wright).—All these stains gave a clear picture but it was difficult to differentiate the two colours as easily as with eosin and methylene blue.

(6) *Eosin and Methylene Blue*.—This was generally satisfactory. The technique is rather difficult and each separate slide requires individual attention, but a very clear picture can be obtained.

(7) *Mann's Stain*.—One of the best stains for the purpose. It must be remembered that both the red and blue dyes are acidic and therefore the colour of the various granules depends entirely on the differentiation. Ford [14] considers Mann's stain as unreliable and describes a technique for improving the staining of granules. The method described in *Johns Hopkins Bulletin* [15] was found quite satisfactory.

The stains used as a routine were Mann's stain and eosin and methylene blue.

EOSIN AND METHYLENE BLUE.

(Modification)

Solutions.

Eosin.

5 per cent. watery solution	} Equal parts.
Saturated alcoholic solution	

Methylene blue (stock).

1 per cent. aqueous solution.

Dilute 1 in 4 before use.

Method.

- (1) Take the sections to water.
- (2) Flood the slide with eosin solution. Burn. Allow to cool.
- (3) Differentiate in methylated spirit and ammonia. (2 drops to 100 c.c. of methylated spirit.)
- (4) Add methylene blue and heat.
- (5) Differentiate with methylated spirit to which is added 1 or 2 drops of colphorium.
- (6) Dehydrate, clear and mount.

MANN'S STAIN.

Fix in Helley's fluid, ZENKER's fluid, Formalin or Bouin's.

(1) Wash in water.

(2) Stain 2-12 hours in Mann's stain.

2 hours in the incubator,

or 12-24 hours at room temperature (best).

1 per cent aqueous eosin (water solution yellowish)	35 c.c.
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1 per cent aqueous methyl-blue...	35 c.c.
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Water	100 c.c.
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(3) Wash in water.

(4) Differentiate in 95 per cent alcohol containing 2 drops concentrated ammonia water to 50 c.c. of alcohol (1 min. is sufficient after 12 hours).

(5) Wash in several changes of 95 per cent alcohol to remove the alkali.

(6) Keep 30 seconds to 1 minute in water acidified with a few drops of glacial acetic acid.

(7) Wash in water, dehydrate quickly in alcohol, clear in xylol and mount.

Note.—If the blue is too easily removed, substitute in (4) water plus 1 drop of ammonia to 50 c.c. of water, followed by (5) washing in water.

Reference—*Bulletin Johns Hopkins Hospital*, July, 1933, p. 56.

APPENDIX II.

Biopsy material was examined for the presence of inclusion bodies. Only very small pieces of tissue were available. Mann's stain was used in each case.

(1) Papilloma from the tongue.

(2) Papilloma from the hard palate.

(3) Papilloma from the cheek.

Nothing resembling the inclusion bodies described could be seen in any of these sections.

A paraffin "wart" was also examined, but no inclusion bodies could be found.

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A CASE OF HUMAN COCCIDIOSIS.

By BREVET COLONEL R. PRIEST, M.D., F.R.C.P., K.H.P.

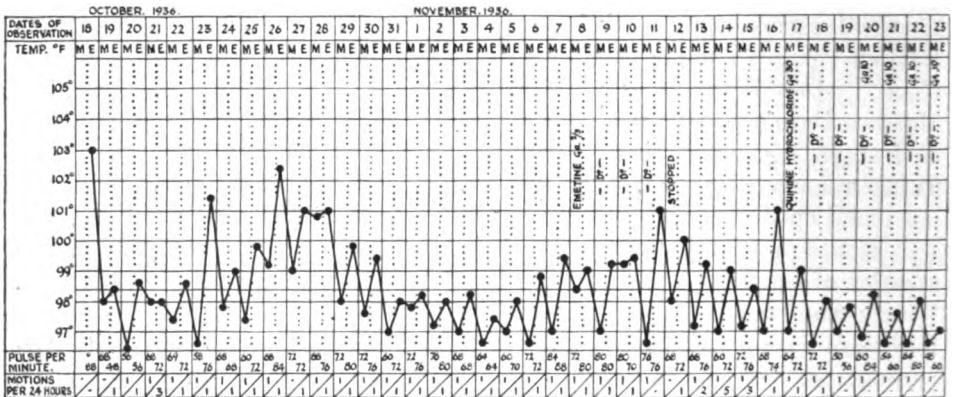
ACCORDING to Manson-Bahr (1935), more than 150 cases of infection by *Isospora belli* (Wenyon, 1923) have been recorded, and although the organism is undoubtedly parasitic in man, it is not seriously pathogenic, yet in the two cases quoted by Manson-Bahr there was continuous and debilitating diarrhoea of six weeks' duration, associated with numerous Charcot-Leyden crystals and pus cells in the fæces, and a high eosinophilia in the blood. Most of the cases came from the Eastern Mediterranean area, but Manson-Bahr's patient was infected in the West Indies. Since then cases of human coccidiosis have been reported from other regions such as Transcaucasia, Habana, and Hawaii. The coccidium develops in the intestinal epithelium, thereby bringing about destruction of the cells, and so it would appear that the patient's symptoms depend not only upon the severity of the infection, but also upon the amount of epithelium invaded. In animals such infections are often the cause of serious enteritis which may terminate fatally (Wenyon, 1915). The infection by *I. belli* is not often pathogenic, and therefore not much attention has been directed to the treatment of the condition except that drugs like stovarsol, yatren and bismuth salicylate have been suggested in a general more than a specific manner. The case reported from Habana was treated successfully with anguicide, i.e. gentian violet (Kouri and Basnuevo, 1936).

The patient, whose clinical story is related below, responded well and quickly to quinine hydrochloride.

It is thought that many species of flies play an important rôle in the transmission of the infection because the oocysts are reported to remain viable and unaltered in the intestine of the fly for twenty-four hours and are evacuated as such in the fæcal droplets. Oocysts have also been recovered from the external parts of the body of these insects (Metelkin, 1935). An illustration of the extracorporeal development of *Isospora* is given in the official copy of the Memoranda on Medical Diseases in Tropical and Sub-tropical Areas, 1930.

Guardsmen C., aged 24, serving in Egypt, his only foreign station, suffered from diarrhoea in April, 1936, which kept him in hospital for thirteen days. He was admitted to No. 3 British General Hospital, Alexandria, on October 18, 1936, complaining of headache, a feeling of feverishness, epigastric discomfort, flatulence, vomiting, and two or three loose motions in the day. On examination his temperature was 103° F.; pulse 88 per minute. Heart and lungs were healthy, the spleen was easily palpable, but the liver did not appear to be enlarged. Blood films failed to demonstrate malaria parasites. The stool did not suggest dysentery

macro- or microscopically. For the next ten days the patient showed an irregular intermittent pyrexia varying from normal to 102° F. During this period vomiting was troublesome. He continued to have abdominal pains and fluid stools. The latter were bile-stained, contained some mucus but no blood, and by the microscope the constant presence of very numerous oocysts of *I. belli* (Wenyon, 1923), subsequently confirmed at the Royal Army Medical College, London, was noted. No amoebæ, cysts, parasitic ova, or Charcot-Leyden crystals were seen in any examination. Repeated blood-films showed no malaria parasites. The urine was normal and



sterile on culture. The blood-counts showed a leucocytosis of 17,000 per c.mm., with polymorphs 30 per cent, a relative lymphocytosis 59 per cent, and an eosinophile count ranging from 8 to 12 per cent. Then followed a few days of apyrexia, but afterwards the irregular fever returned. A course of emetine failed to check the diarrhoea; the spleen had increased in size and his general condition was deteriorating. On November 14 Major Bridge wrote to me asking whether this man's illness could be associated with the constant presence of the oocysts in the stools, since in spite of all investigations, no other cause had been found. We conversed over the telephone and we agreed that as the life-cycle of this parasite resembled that of malaria, differing in the fact that it invaded the intestinal epithelial cells instead of the red blood corpuscles, it would be well to administer 10 grains of quinine hydrochloride by mouth three times a day for three days (November 17, 18 and 19) and to continue thereafter with 10 grains of quinine each morning along with magnesium sulphate by the mouth every two hours, liberal fluids and a course of stovarsol. The effect of this is well seen in the temperature chart. By November 24 no oocysts could be found in the stools even after prolonged search, the temperature became steady, the eosinophiles had fallen to 5 per cent and the patient felt very much better. The magnesium sulphate was reduced, the fluids were gradually replaced by solids, stovarsol was stopped on December 3, and when I saw him on this date his convalescence seemed to be well established. At the

time of his discharge from hospital on December 11 the spleen had completely receded, no more oocysts had been found since treatment was commenced, he had gained seven pounds in weight in ten days, the eosinophiles had fallen to 2 per cent and all abdominal pain and discomfort had disappeared.

I have to thank Colonel G. H. Richard, Deputy Director of Medical Services, British Troops in Egypt, and Colonel A. D. Fraser, D.S.O., M.C., M.B., Commanding No. 3 British General Hospital, Alexandria for permission to submit these notes for publication. Also my best thanks are due to Major G. A. Bridge, M.C., M.B. and to Captain W. D. Hughes, M.B., R.A.M.C. for their kindness in supplying me with the clinical notes of the case.

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SHIKAR IN THE WESTERN GHATS.

BY LIEUTENANT-COLONEL H. G. PEAKE,

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ONE very often hears nowadays that there is no shikar in India. But as the following tale will show good shikar can be got, but it means expenditure of quite a lot of energy and patience.

In the Western Ghats (Bombay Presidency) very good jungle can be found and especially so in the Igatpuri-Ghoti portion of the Ghats. These ranges go up to about 2,000 feet above the road level. The ordinary conformation of these ranges is about 1,000 to 1,500 feet steady climb and then there is a kind of plateau with a further central climb of some 500 feet. The jungle on the plateau is in parts very thick, but not high, composed of numerous kinds of thorny bushes which are in places matted together.

Numerous small villages are scattered about at the foot of the Ghats, and agriculture, cattle-breeding and rearing are the only industries. Each village has its herd of cattle which during the day wander all over the Ghats. The villagers are Hindus of the Thakur tribe; all of them are keen shikaris, and they will eat any kind of animal or food except the cow or nilghai. These two are sacred.

Panthers are a very common denizen of these jungles, particularly in the winter time, September to March, and they do much damage to the cattle that wander about all the day. According to the local inhabitants monkeys, which abound, are the favourite food of the panther, but being more difficult to catch the panther falls back on the easily killed cow or bullock.

In this area a good male panther may be about eight feet in length, but the average is about seven feet. The colour of the fur varies from bright orange with black spots to a drab yellow. Last year a black panther was seen and shot at from a long range, but was not hit. On two occasions specimens have been got with partial black rings round the neck, the ring being broken at the throat.

In the scheme of wild jungle life there may be a cause or reason for the tiger, but one can find very little for the panther. He is a cowardly beast in the ordinary way and kills for the sake or joy of killing. Nothing comes amiss, monkeys, peafowl, dogs, goats, cattle—and he will kill much more than he needs for food. Numerous cases can be cited where one panther has killed more than once during the twenty-four hours and just left the dead animal.

In this area of the Ghats a panther had become a veritable rogue. Some three months previously he had been shot at with lethal goli and slightly wounded in the leg, but had remained in the area, and because of his

lameness and lessened agility had lived on the local cattle. He was supposed to have some forty to fifty cattle to his credit. The villagers were very upset and worried about their loss. Personally they had no fear for themselves as they are an extremely brave and fearless people and any two men with their spears would cheerfully and willingly attack any panther. The only animal they really dislike is the wild boar. One day I got information from the head man of one of the villages (also he is chief shikari) that the panther had been surrounded in a patch of jungle.

Off I went some thirty odd miles by car with the necessary weapons and a thermos. It took some three hours very hard work, during the heat of the day, after leaving the car to get to the jungle where he was supposed to have been cornered. On arrival there I was informed that he had got out of that area (thick low jungle) and moved on. A "lookout" on the high central cliffs had seen him move on about one to two miles to another thick patch. So on we went. One amusing event happened as we were going along—one of the beaters began to scream and dance. I thought he had been bitten by a snake but when I got up to him I found quite a big black and yellow crab hanging on to his toes. (Something new to find crabs so high up in the hills.) It caused much amusement amongst the other beaters.

Well to get on with my tale—we got to the area where he was supposed to have settled. It was a deep and very high cul-de-sac in the hills. I arranged the beat and got into what one might consider a good position, the branch of a tree about six feet from the ground—most uncomfortable. In the Central Provinces a proper machan would be made on which one can be comfortable and sit at ease. The beat started, and a beat is usually full of interest; in the distance the shouts of the beaters and their tapping of the trees and the thud of rocks as they are rolled down the hillside; then the animal noises. An old peacock comes flying past making as much noise as an ancient aeroplane; a wild pig crashes through the thick undergrowth, and then there are the monkeys. These, if there is a panther about, are a very good guide to the panther's movements. He is their deadly enemy and if he is near they will chatter, shriek or growl, and make most uncouth noises. If the panther happens to be on the run they will usually follow him up, swinging from tree to tree, shrieking at him as they move along.

I sat on my uncomfortable perch for about one to one and a half hours when a shrill whistle from the head shikari, who was with the beaters, warned me that there was a panther somewhere near. Suddenly without the slightest noise there was a yellow flash about thirty to forty yards on the left which stopped for a moment. The first bullet hit him (hind-quarters) and knocked him over, but he got up again. Bullet No. 2 got him in the chest and that was his end. After the first shot there were shouts from some of the beaters that a big panther had dashed back through them and got away. This one was the rogue that I was after and the dead one

was another that happened to be in the beat at the same time. The rogue heard the shot and knew that meant trouble and turned and bolted. This is very unusual in a panther, as normally he will keep going forwards to get away from the beaters.

The dead one was a fairly good animal about six feet ten inches with extremely good fur—bright orange.

Two days later I got a message to come out again to the rogue. He had been seen the night before on a kill and the villagers had surrounded the area, and kept watch with fires all through the night. When I got there I found he had eaten his fill and gone into a cave in the hillside. The cave had two openings—one large and one small. There were well defined “pug” marks into the large opening and no exit marks. We tried to stone him out with no result, so then we tried to smoke him out. For two hours large volumes of smoke poured through from the small hole and out at the large, but we could not shift him. As it began to get dark and it meant climbing down the Ghats I had to leave him, but some villagers kept watch from a nearby tree. About 10 o'clock at night, bright moonlight, he came out of the cave and disappeared in the jungle.

He still remained in this area of the Ghats doing an occasional kill, but the shikari could not send definite information as to his whereabouts until, about ten days later, I got word again and went out. On the previous evening he had killed quite a large-sized cow just outside one of the villages. He had been driven off with stones, etc., and gone back to the hills. I got to the village about 11 a.m., and started to climb. After about one hour's climb we came to another dead bullock, a small part eaten out of the shoulder but the body was still warm. It could only have been killed quite recently and the panther was pretty certain to be somewhere very near. The noise of our hill climbing must have disturbed him while feeding. The jungle was very thick in this area. The chief shikari advised the beat in a certain direction and I got into a tree; a most precarious position, the tree jutted out at an angle from the hillside and behind me from my seated position was a drop of some thirty feet and horrid hard rocks. In front of me was an open passage about six yards wide and as I expected he would dash across this I thought lethal goli in a 12-bore the better weapon. As it happened I was wrong and I wish I had relied on the rifle. The beaters did their work well and he strolled across this passage some twenty-five yards away. Gave him one barrel of the lethal goli. He rolled over and disappeared in the thick undergrowth and I lost sight of him, but could hear him grunting and moving away but could not see him. A “look-out” high up on the cliffs saw him going slowly to another thick patch about a quarter of a mile away. Evidently severely wounded I followed him up and surrounded the area, and then by heavy stoning got him to move out when a rifle bullet finished him off.

On examination I found that the first shot (the lethal goli) had smashed in the whole of one side of the head. This would have finished

him later on but the shikari rule of not leaving a wounded animal necessitated following him up and finishing him off. The keenness and willingness of these native beaters fills one with admiration for their bravery. Even though they appreciate the danger of following up a wounded panther they are quite ready to beat or round one up with only their spears as weapons. Four out of this lot of beaters had scars on their arms or shoulders as the results of encounters with panthers.

On examination of the body the villagers' exaggerated idea of the size of the beast was not borne out. He was about seven feet in length and his coat was of only a drab yellow. In all probability he was older than the average panther shot and was reckoned to be about 10 to 15 years old. There was great rejoicing as this was the end of the rogue.

The skinning of the body was watched with great interest. Every bit of the fat and practically all of the flesh was taken away by the villagers. Each one would eat a portion of the meat, thereby gaining the cunning and strength of this animal. The fat is used as an external application, as liniment or embrocation, and is supposed to be a panacea for every possible ache or pain.

It was, of course, just a matter of chance getting two panthers within a fortnight, but if one is keen on shikar, has the time and patience, and is living anywhere near the Ghats, it is nearly always possible to get one in time.

LETTERS FROM THE PENINSULA.

WRITTEN IN 1811 BY CAPTAIN CRANSTOUN GEORGE RIDOUT,
11TH LIGHT DRAGOONS.

SELECTED AND EDITED BY HIS GRAND-DAUGHTER, MRS. BLACK-HAWKINS.

(Continued from page 252).

“ We were not sorry to return to our old quarters at Castellaga though only for two or three hours, as we knew we should receive a warm welcome from our old Patrones. It was 11 o'clock ere we gained the village, although the distance was not more than four miles from Fuentes. The night being very dark and the road extremely bad as well as difficult to find, caused us much loss of time, a matter of no small import situated as we were, and with a full belief of a general action being only at the distance of a few hours. Every one repaired to his late quarters and I did to mine. The family had been at prayers and were preparing to go to bed, when a knocking at the door caused them all to jump from their seats and occasioned for the instant a small degree of alarm, not knowing the business or condition of their nocturnal visitor. The good people no sooner recognized their late inmate than they expressed themselves in the warmest manner glad to see me, and each and all were ready to offer every little attention in their power towards rendering me comfortable. My Patrone's children, with whom I had ever been on the best terms, heaped on the expiring fire a quantity of dry chips which, blazing up on the instant, diffused around a degree of cheerfulness extremely pleasing, rendered doubly so by the coldness of the night, for though only September it was equal to that of December in England. My kind friends prevailed on me to lie down, seeing that I was worn out by fatigue, and to this I readily assented, though somewhat reluctant to leave the comfortable corner of the fireplace. Having seen my horse fed and given orders for him to be ready soon after 1 o'clock, I withdrew to my bedroom and taking off my pelisse I lay down, though not to sleep, the great exertion of the day having brought on a considerable degree of fever, and I rose again at the end of two hours unrefreshed, or in other words, very unwell. My Quartermaster now entered the room, and told me the Brigade was to form immediately on the road leading to Fuentes Guinaldo, the Eleventh in the front. The two regiments, German Hussars and 11th, were soon on horseback and at the spot appointed, from which they marched off as soon as Baron Alten made his appearance. The morning was very cold, and dark as possible, and as we journeyed on to Fuentes, many of the dragoons fell asleep on their horses, most of them having sat round the fires of their several quarters during the three hours of our stay in Castellaga.

"On our arrival at Guinaldo just as the first few streaks of daylight began to appear, we found the British and Portuguese Infantry with the whole of the cavalry, assembled in front of the town, and everyone seemed impressed with the certainty that an action throughout the whole line was momentarily about to commence. The enemy's lights were plainly to be seen, and from the number, as well as the noise they made, there could be little doubt of their being in very considerable force. Our fine fellows anxiously waited for the rising of that sun whose setting many, it was more than probable, would not live to see; still, all were very cheerful, many gay.

"The 1st German Hussars and the old Eleventh were now ordered to the front, and the Heavy Dragoons on being relieved at the out-posts fell back on Guinaldo, and with the rest of the cavalry awaited in silence the coming day, now rapidly advancing from the shades of night.

"The Brigade being now formed in front of the enemy under cover of a small eminence, and our videttes close on those of the French Hussars, we dismounted, to save as much as possible our poor horses still jaded with the work of the day before. My own horse I found had not a bit too much spirit, and the gunshot wound he had received by no means added to his activity, or to my satisfaction in riding him.

"I could not but regret the loss of my favourite horse the day before, than whom there was not a better in the British cavalry.

"It was now daylight, and to our view at the distance of three-quarters of an English mile, appeared the whole French Army. They had not taken up any position, nor were they in order of battle, but in one confused mass of thousands on the slope of a hill. It was soon ascertained that they were then employed in receiving rations, and from the shouting which shortly after took place it was evident that spirits had been issued to the Troops, and from this circumstance there could be no doubt, if doubt there had been, of a general action being about to be fought in the course of the morning. Sir Stapleton Cotton about 8 o'clock rode up the hill where our Brigade was stationed and having dismounted began very attentively to examine the situation, and ascertain if possible the force of the Enemy, and appeared much surprised at not finding them prepared for action. From the extent of ground occupied by the Enemy, the whole of which was entirely covered by their columns of infantry and masses of cavalry, their force was estimated at not less than 70,000 fighting men, with a very numerous train of Artillery. The Plain on which both Armies stood had, on its right to the British, a chain of hills from the summit of which the allied position was to be seen. A body of Cavalry had gained these heights, and at first we had reason to believe that they formed part of General Anson's Brigade, and that they were a detachment of the 16th Light Dragoons. A short time only, however, was necessary to undeceive us and to ascertain to a certainty the cause of their being there: as well that they were not British Dragoons, but French Hussars of the Imperial Guards

in attendance on Marshall Marmont, whom by the help of our glasses, we could plainly discover reconnoitring the British line. The cause of our not being attacked as early as was expected was now accounted for, Marmont not having completed his arrangements and being unable to do so till he had made his reconnaissance.

"A few minutes after, the whole of the French Army rose from the ground, for they had been lying down from sunrise, and standing to their arms which had been piled immediately in their front, gave three cheers. Marshall Marmont having descended from the height already mentioned, and being obliged to pass in front of the Enemy on his way to the British left, and not having been seen before by the troops of Count Dorsenne, the whole had given him three cheers, upon which they again stretched themselves on the ground.

"The day was now so much advanced (one o'clock) and nothing having as yet been attempted on the part of the Enemy, it was the opinion of everybody that the attack would be deferred till the following morning. Orders were sent to the rear, to the Commissaries of the troops, to bring up rations for the men and corn for the horses. Long, however, ere we could receive either the one or the other, the Enemy was in motion, and it was evident they were making their dispositions for attack. About 20,000 men were immediately moved from their right towards the left of the British, and a second body of about 15,000 Infantry, with some squadrons of Dragoons and Hussars under the order of General Mont Brune moved on our right, with a view of turning the position of Guinaldo. Still the main body made no forward movement, although apparently inclined to do so. The Enemy had placed in their centre about 22,000 of the Imperial Guards, Cavalry and Infantry. These troops Marmont reviewed, and they marched past in Columns of Brigade till the whole had gone by, when they again formed on the same ground and nothing further took place.

"Lord Wellington having in like manner thoroughly reconnoitred the situation of the Enemy, and being enabled to see their entire force, did not consider himself warranted, owing to the very great disparity in number of the British and Portuguese, the which united did not exceed 40,000 men, to risk an action in the ground he then occupied, where his Infantry would be exposed to an overwhelming force of Cavalry and formidable Artillery. The Army received orders to be ready to fall back as soon as it was dark, and Baron Alten's Brigade (11th Light Dragoons and 1st German Hussars) directed not to leave the ground in front of the Enemy for two hours after the whole should be in motion. To cover as much as possible our movements numberless fires were made, with the view of its being supposed that we yet occupied our ground at Guinaldo. The videttes were withdrawn from before the French Hussars by degrees, and took up the station of the Brigade on the eminence where it had rested during the day. Night now set in and the whole army commenced its retreat on Albergaria, and continued without intermission during the

remainder of the night. At ten o'clock, the 11th and 1st Hussars moved from their ground and, passing through Fuentes Guinaldo, followed the track of the British Army.

"The night was very fine, moonlight, and although the roads were blocked up by troops of all kinds, no confusion or disorder occurred. A six-pounder having been overturned in a narrow and very bad road, occasioned a halt, and a separation of the troops for a time, but the obstacle being removed we again pushed on. On our arrival near Albergarria we found Major General Slade's and de Grey's Brigades of Heavy Dragoons en Bevouaick, and as Baron Alten formed the rear-guard it was necessary to halt till they again proceeded, which they did as soon as their horses had fed. By eight o'clock in the morning of the 27th we arrived at the small village of Aldea de Ponte, distant from Guinaldo about eighteen English miles. The ground in its front and rear is very strong, and difficult of approach from being confined.

"Here the British Infantry had arrived and here it was determined to await the approach of the enemy, whose Light Cavalry and Chasseurs were now up. The ground was immediately occupied, and the village of Aldea de Ponte was to be disputed and maintained, *coute que coute*. From the information of a French Hussar, with whom I afterwards conversed, it appears they had moved from their ground to attack us at 2 o'clock in the morning, and that Marmont had told them that if they succeeded in beating us, of which he stated there could be no doubt, he would drive us to our lines at Torres Vedras. Their surprise was great on finding Guinaldo without a soldier of any kind, and they soon found we had been off some hours. However, the whole pushed on rapidly, with their Cavalry and light troops in front, and in order to ensure a quick pursuit, they divested themselves of everything likely to impede their progress, and such good use did they make of their time that by 8 o'clock they had gained on the British, and now nothing remained but to make themselves masters of Aldea de Ponte.

"The village was occupied by a Brigade of the 4th Division, while the remainder of the Infantry took post in the strong ground immediately in its rear, and from which our guns could play on the Enemy's advancing columns. It was nine o'clock when the first cannon shot was fired, and this was immediately replied to by a very heavy and destructive fire of grape and round shot from the Enemy's Batteries. The contest here became very severe, and as the Enemy seemed resolute in gaining the village, they brought up a large body of Infantry and the British for the moment were compelled to fall back, though not before they had caused their opponents a very heavy loss. Orders were directly issued by the Commander of the Forces for its immediate recovery, and our gallant fellows dashed forward in the finest style possible, and the village was again in our possession.

"The fire of the Enemy's Artillery was kept up with unabated fury

on the devoted village, which was now become the scene of a frightful carnage, owing to the obstinacy of both parties in endeavouring to keep possession of it. A second time it was to be taken, and as before, the French were driven from it with great loss. Fresh troops having been brought up, and in very considerable numbers, the action became general, and several charges took place on both sides with various success, the enemy in one quarter and we in another. The 11th Light Dragoons and 1st German Hussars were exposed to a destructive fire from the French Artillery, and many lives were lost without their having the opportunity of avenging themselves, from the confined and broken state of the ground. Towards dark the enemy once more made a most furious attack on the unfortunate village, and having brought forward six fresh battalions of the Imperial Guards, with twelve pieces of nine-pounders, they opened so heavy a fire of grape and cannister shot, that the British were reluctantly compelled to fall back, disputing every inch till they gained the heights, from which they still kept up a cannonade on the town.

"The enemy did not dare to follow them, but was content with a lively fire of their 9-pounders, the which was continued till long after dark. By 8 p.m. the firing on both sides had ceased, and although the British had withdrawn from Aldea de Ponte, they had not lost a foot of ground immediately in its rear.

"The Commander of the Forces was determined on renewing the contest by the first dawn of day, and during the night every arrangement was made for carrying it into effect.

"The loss of the British Army during the day did not exceed 800 in killed and wounded; that of the enemy was very considerable, but their being still in possession of the village it could not be ascertained with any exactness. It was estimated at no less than 5,000 *hors de combat*. As soon as it was light, Baron Alten's Brigade, 11th Light Dragoons and 1st Hussars, were directed to reconnoitre the enemy, and push on through the town should they have fallen back, which there was reason to believe they had done. The 11th and German Hussars were instantly in motion and in the village. It was immediately known that the enemy were off, having effected their retreat under the cover of their Horse Artillery, which had been brought up at the close of the day. The British Army again advanced, and the whole of the Cavalry were ordered to support the old 11th and 1st German Hussars in pursuit of the French rear-guard, with which they came up at Albergarria, and several brilliant charges of Cavalry took place, and decidedly in favour of the British Dragoons. Marmont retired on Salamanca, Coria and Placentia, and we resumed our old quarters at El Boden, Guinaldo and Ituero, and Ciudad Rodrigo was again narrowly watched. Count Dorsenne returned to the north and the campaign closed."

The following letter written nearly three weeks later than the foregoing contains some incidents of interest and is dated:—

" Celerico, 3 Leagues from Guarda,

" October 26th, 1811.

"I did not think to have written you again from this Hospital, for such is the Town of Celerico. Not a house but what contains sick officers and and soldiers, every habitable place is crammed full of unfortunate beings belonging to the British Army, almost to the entire exclusion of the wretched inhabitants. Between the friendship of the British, and the oppression of the French, the poor Portuguese are very much to be pitied, and I am inclined to think that they would be willing to part with millions of dollars if their friends had all their throats cut, and their enemies were annihilated in any other way.

"Anything, in short, to be quit of both parties. The Spaniards the same; not that the Spaniard cares one jot who sits on the throne, whether Ferdinando Septimo, or Joseph Napoleon, but they do want to know who are to be their masters, the French or the English. They do not know how to act. One day we command in Ituero and the French the next. For any civility or kindness they may have shown the British, thinking all secure and safe, the French take care to punish them. On our return and not meeting the same attention as before, we in turn abuse them. I will just mention what fell within my own observation on the morning of the 25th of September, a day I shall remember to the last moment of my existence. When the French were seen advancing from Ciudad Rodrigo towards El Boden and the British were drawn up in order of Battle, awaiting in silence their approach, with our Artillery ready to play on them as soon as they should arrive within a given distance, the whole of the inhabitants assembled on an adjoining hill to view the scene about to commence, so as to enable them to determine the line of conduct they were so soon to adopt, and to greet with 'vivas' whoever might be victorious. If in favour (and so indeed it was for a time) of the French, oh, then it was 'viva Franceses' and 'maldeta' (everything that is bad) 'los Ingleses.' Reverse the thing and it is 'Maldeta a Franceses,' and the English are the first of People. The French was soon in El Boden, and there captured many Englishwomen. Marshall Marmont, when the Enemy halted to dine about 4 p.m., sent his compliments to Lord Wellington, to say that many Englishwomen had fallen into his power, whom he should be happy to liberate if Lord Wellington wished, and if so, to send an Officer for them. Lord Wellington sent one of his Aides-de-Camp, but Marmont would not let him return. Marmont was preparing to attack us with all his forces the next morning (the 26th) and therefore he was unwilling to allow Major Gordon, who saw everything going forward and his strength, to return till the action should have been fought. Marmont was very civil to him during his stay, and spoke in high terms of General Baron Alten's Brigade (11th Light Dragoons and 1st German Hussars), and of their gallantry on the 25th. He only complained of our men not giving quarter. Had we had the support of another Brigade of Cavalry

we might have made a vast number of prisoners, but those we made in each charge we were unable to keep, and therefore were obliged to cut them down to prevent their return.

"I should like to have had plenty of time to have wandered over the Field of Action. I might have realized a small fortune from amongst the dead horses, the saddlebags of the French Dragoons being usually full of plunder of one kind or another, and frequently money to some amount. An Officer of the 13th Dragoons got £800 in Noidores, and another hundred in Napoleons and golden guineas, after killing the officer who owned the prize and who had previously run him through the arm and given him several severe cuts which he showed me.

"Through my poor horse being killed I lost my saddle and all my appointments belonging to the poor animal, and only saved my cloak in which was my pelisse, and my valise containing my shaving things, two shirts, Bible and Prayer book and one or two other things. These were saved for me by the Dragoon whose horse I had immediately mounted, and I only yesterday recovered them exactly one month since that day.

"Lord Wellington was here a few days ago, and was enquiring the number of deaths a week in Celerico. He was told sixty or seventy a week, upon which he asked whether that was considered many. You may calculate how many must be lost to the Service when that is the case for weeks together. Lord Wellington is most indefatigable; he will make nothing of riding here from Frenada before breakfast, though it is eight long leagues (thirty-two English miles), and a bad road, and returning to Frenada to dinner. He is ever on the move, and knows everything going forward. He never trusts to anybody, and no one in the army knows what is to be done till it unfolds itself. Colonel Murray, the Quarter-Master-General, is said to be the only person with whom he converses in private, and it is not clear that he reveals his plans even to him. He takes his amusements of a morning with General Stewart, and with two or three braces of Greyhounds they kill many hares.

"Before concluding this letter I must tell you that our praise resounds through the Army, and nothing else is spoken of, though there is as much scandal going forward in an Army as among gossips in a country town, and there is as much pleasure in traducing the character of a Regiment as one Miss has in making her ill-natured remarks on the conduct of another."

The foregoing extracts from Captain Ridout's letters may perhaps be fittingly concluded by a further one, which, though not in order of sequence, having been written in the previous July, may yet be interesting in the light of the events afterwards narrated.

Writing on July 22, 1811, and heading his letter: "The Plain, between Elvas and Badajoz," he says:—

"The purport of this letter is to apprise you of the 11th Light Dragoons having been removed from General Long, to General Baron Alten's

Brigade, who has with him the 1st Regiment of German Hussars, a very fine and distinguished corps. On its being notified to General Long that the 11th Dragoons were to be removed to General Alten's Brigade, he was pleased to express himself in the following order sent to the Regiment :—

' Camp near Elvas—19th July, 1811.

“Major General Long would not do justice to his feelings if he refrained from expressing the very great regret with which he observed in the General Orders of yesterday, the intended separation of the 11th Light Dragoons from the Brigade under his command. He begs to assure the Officers, Non-Commissioned Officers and Privates of the corps, that in no hands could he feel his credit in the Field more securely placed than in theirs, and he is not less persuaded from personal observation that by the zeal and attention of the Officers, and the orderly behaviour of the men, their conduct in Quarters would have been equally a source of gratification to him. The Major General requests that Colonel Cumming, and the several Officers of the 11th Light Dragoons, will be pleased to accept his thanks for their attention and support, and his acknowledgments are not less due to the Non-commissioned Officers and men for their steady, creditable and soldierlike behaviour during the time they have been placed under his orders. He wishes sincerely to the Regiment the attainment of every success and degree of glory that valour and discipline can command.”

“You will allow this was very flattering and showed a disposition on his part to be satisfied with our exertions. I dined with him yesterday, and he was uncommonly civil and attentive. He declared at Sir Stapleton Cotton's table, he would gladly give up half his pay, and all his allowances, to be permitted to keep the 11th in his Brigade. I cannot see the advantage to be derived from the change, the only thing is that the 11th Light Dragoons and the 1st German Hussars being the stoutest and two finest Regiments, are to be kept ready to come into the Field on the first alarm, or on any movement on the part of the Enemy.”

That General Long's estimate of the 11th Light Dragoons was fully justified was shown in the testimony accorded them by the Commander of the Forces when he rode up to Baron Alten's Brigade (the 11th Light Dragoons and 1st German Hussars) after the affair of El Boden and personally thanked them and the 1st German Hussars for their “gallant and heroic conduct.”

Editorial.

REPORT ON THE HEALTH OF THE ARMY FOR 1935.

IN submitting his report to the Under Secretary of State, the Director-General states that the general health of the soldier has continued to be very satisfactory in the year under review.

The admission ratio was lower than that of the previous year by 10·5 per 1,000; deaths were 0·1 per 1,000, invalids sent home 0·65 per 1,000, and invalids discharged from the Service 0·2 less than in 1934. These figures constitute a new post-war low record.

Chart I illustrates very strikingly the improvement in the health of the Army since 1921. It shows in 1922 a big drop in admissions to hospital. A similar fall, continued in 1923, in invalids discharged, constantly sick, and sick time to each soldier.

The admission ratio for the year was 392·1 per 1,000 of the strength, compared with 402·6 per 1,000 in 1934 and 428·5 for the period 1930-34.

The principal causes of admission to hospital in 1935 were: Inflammation of areolar tissue, inflammation of tonsils, and venereal diseases. The commands with the highest ratio of inefficiency were: Jamaica, Ceylon, Mauritius, Malaya, China, in the order mentioned. Bermuda, Malta and Gibraltar had the lowest ratios.

The principal causes of inefficiency on account of sickness in hospital were: Gonorrhœa, fracture, inflammation of areolar tissue, and inflammation of tonsils.

The enteric group of fevers gave rise to 129 admissions: of these 10 died. In India there was 106 cases, and in Egypt 16. An analysis of the cases showed that 29 were typhoid fever, 14 paratyphoid A, 11 paratyphoid B, and 75 enteric group (undetermined).

The incidence among British troops in India in 1935 was slightly greater, 0·3 per 1,000, than in 1934. But the incidence in 1934 was the lowest yet recorded, and that in 1935 was the next lowest in a period of sixty-four years.

In contrast to British troops, the progressive fall among Indian troops has continued. It has to be noted, however, that a considerable proportion of the cases now diagnosed as belonging to the typhus group would three years ago have been included among the enteric group. It is difficult to assign any comparative value to the annual statistics for Indian troops owing to the greatly improved bacteriological investigations during the past ten years. In 1920-25 there were 148 Indian cases of typhoid fever diagnosed bacteriologically, whereas in 1930-35 there were 549 cases so diagnosed.

There were 13 deaths among the Indian cases, and a striking feature in these cases was that death occurred before the end of the second week, suggesting either an overwhelming infection or an ambulant type of cases. The great majority of the Indian cases had been repeatedly inoculated during their service. One case which had been inoculated on seven occasions died of perforation on the eleventh day.

In the Report for 1933 attention was drawn to the fact that among British troops the bacteriologically proved typhoid cases showed a higher admission ratio, case mortality, and death ratio in men under one year's service than in those over one year's service. In 1934 and 1935 the admission and death ratios in the group under one year in India had fallen markedly as compared with the group over one year in India. It is thought that this fall is due to the improvement in the T.A.B. vaccine manufactured at the Royal Army Medical College since 1933. The case mortality was, however, disappointingly high in 1934 and 1935, and seemed to be due to the type of cases noted among Indian troops.

Before the year 1929 it was the custom to re-inoculate all troops with 1 cubic centimetre T.A.B. vaccine, but owing to the fact that 50 per cent of the cases occurred annually within six months of inoculation, the two-dose method of $\frac{1}{2}$ and 1 cubic centimetre at eighteen-monthly periods was introduced in that year. Since 1929 the percentage of cases falling within the first six-monthly period after inoculation has remained during a period of seven years at just over 30 per cent, which appears unduly high. Nearly every year the highest percentage lies between six and twelve months, and the lowest between twelve and eighteen months when it might be expected that the protection would not be so great.

The typhoid group of diseases in India shows a marked incidence during the hot weather months May to September. In the Northern Command, where the seasons are very distinct, there is a high incidence in the hot weather months for typhoid fever in both British and Indian troops. A proportion of the Indian troops are regularly infected during leave in their villages as this corresponds with the hot weather months.

In the report for 1934 attention was drawn to the unsatisfactory results obtained with "TO" alcoholized suspensions in cases of the enteric group. An attempt has been made to ascertain the titre of "O" agglutination which might reasonably be attributed to T.A.B. vaccine, apart from the disease, by considering only serological results obtained during the first four days after admission to hospital. It is probable that the results were influenced to a certain extent by the onset of fever. The results obtained from 565 such individuals are given in a table. It is concluded that there is no real base-line of "TO" agglutination titre in an inoculated individual above which enteric infection could be diagnosed by a single test. At least 30 per cent of typhoid cases produce no evidence of "TO" agglutinins by the second week and in only 44 per cent did the titre rise to over 1:50. In twenty-four fatal cases the "TO" agglutinins were present in

higher titres than in the ordinary case. The typhus group of fevers appears to stimulate the production of "TO" agglutinins as well as "H" agglutinins, but they rarely rise above 1 : 50, but occasionally higher titres may be found.

A curious result was obtained in testing the 565 individuals. When the results were arranged in monthly intervals it was found that a group of sixty-two cases within the eleven and twelve monthly period after inoculation gave the highest titres, over 1 : 1,000.

There were 1,723 admissions for dysentery, an increase of nearly 200 cases, causing a rise in the ratio per 1,000 from 8·3 to 9·3. The cases were classified as follows: Bacillary (unspecified), 1,128; amœbic, 189; clinical (undetermined), 406. In Egypt the rate was much higher than in the past few years; this is accounted for by the inclusion under dysentery (bacillary exudate) of many cases formerly diagnosed colitis, enteritis, or diarrhœa. The incidence was highest in November and December, the cases being mainly bacillary exudate and occurring chiefly among troops recently arrived from England.

In India dysentery cases were mainly sporadic and the chief incidence corresponded with the fly seasons. There was a small outbreak of sixteen cases in the Royal Scots at Lahore; these cases were caused by *B. dysenteriae* Sonne, a common cause of dysentery in the spring months of the year in that area.

Following on the reorganization of laboratories in India there has been greater accuracy in the diagnosis, and many cases formerly diagnosed as amœbic are now correctly returned as bacillary. In the period 1920-25 there were 402 cases diagnosed bacillary and 3,176 amœbic among British troops. In 1930-35 there 5,470 bacillary cases and 1,079 amœbic. A similar change is seen in the cases notified amongst Indians troops, but in addition there has been a huge fall in the total admissions. In the first period there were 37,906 cases of dysentery, diarrhœa and colitis, but only 16,705 in 1930-35. This is a reflection of the steadily improving sanitation among Indian troops.

The proportion of the different types of dysentery in 1935 was much the same as in 1934: Protozoal, 10·3 per cent; bacillary, 41·5 per cent; bacillary exudate, 23 per cent; clinical, 25·3 per cent.

The scheme for the investigation of mannite fermenting bacilli was continued throughout the year. We have published the results so far obtained. It is now evident that there are types not described in a "System of Bacteriology" which are widely distributed throughout India, and that these new types are capable of causing dysentery.

There was a substantial fall in the incidence of malaria during the year 1935. The ratio per 1,000 fell from 23·1 to 19·2, which is the best figure yet recorded.

Of 3,549 admissions, 2,955 occurred in India, but the figures for India are most satisfactory. The ratios per 1,000 for the last three years are: 1933, 103·3; 1934, 67·5; 1935, 56·1. The reduction occurred in spite of frontier operations in a notoriously unhealthy area and during the malaria season. In addition, British troops in the Northern Command were brought down from the hills in connexion with civil disturbances during the malaria season. The monsoon conditions, however, were favourable.

Although the total number of admissions for the past two years has fallen remarkably, local incidences have shown that any relaxation of anti-malaria precautions would be followed by an increase in the incidence. At Lahore, where proofing the barracks had reduced the incidence for several years, twenty-nine cases occurred in one battalion out of a total of thirty-four for the whole cantonment. Investigation showed that the mosquito-proofing of the skylight of a barrack room, from which twenty-four cases had come, had been broken. Repair of this and fumigation of the barrack room stopped further infection.

Treatment has been carried out mainly with atebrin followed by a course of plasmoquine, or with quinine and plasmoquine concurrently, for twenty-one days. Medical officers appear to have no particular preference for either mode of treatment. Out of 2,768 cases, 1,381 were treated with atebrin and plasmoquine and 1,060 by quinine and plasmoquine. The opinion appears to be general that atebrin does not always reduce the temperature promptly or prevent a further rise in benign tertian cases after forty-eight hours from the commencement of treatment. It is therefore recommended that quinine, twenty grains a day, should be given for the first forty-eight hours and be followed by a seven days' course of atebrin, a three days' interval and finally a five days' course of plasmoquine.

Since the almost universal use of plasmoquine in the Army in India the chronic relapsing cases of benign tertian malaria which used to be sent to the Malaria Treatment Centre, Kasauli, no longer exist in any appreciable number. The "relapse" figures for British troops in the Northern Command in 1930 were 120·6 per 1,000; in 1935 they were only 13·2 per 1,000.

Trials with atebrin musonate have been made in the Northern and Southern Commands. In the Southern Command relapses occurred in thirty out of seventy-five cases treated; in the Northern Command results were better, but owing to the Mahmand operations reliable statistics could not be obtained. But the field ambulance cases treated by injections of atebrin musonate arrived at the base hospital in Peshawar in a much better condition than those treated by the usual oral method. For cases admitted to field medical units atebrin musonate is considered the most suitable form of treatment as it ensures a comfortable journey to the base.

Operations in Mahmand had to be carried out in the height of the malaria season in a notoriously malarial area. A larger number of malaria

infections occurred though fewer than in 1933, which was a severe malaria year. An anti-malaria officer was appointed, but he arrived two weeks after the commencement of operations, and by this time the Force was already infected. Camps had to be occupied close to streams overgrown with vegetation, and breeding enormous numbers of *A. culicifacies* and *A. stephensi*. The usual measures such as canalizing, oiling the stream and clearing vegetation from its banks were eventually carried out.

By September 18 the maximum number of cases (123) was admitted to field units. After this date they fell to 25 a day to the end of the month. Later the admissions showed a tendency to rise and ten grains of quinine were given to each man in the most infected units. This treatment, now known in India as "treatment with delay action quinine," afforded valuable assistance by keeping troops on duty for a more or less limited period.

Fevers of the typhus group were responsible for 82 cases among British and Indian troops. There were three groups of cases : XK, 18 cases ; X2, 14 cases ; X19, 43 cases. Of these, 45 cases occurred in the Southern Command. The seasonal incidence was chiefly in the post monsoon and cooler months. The symptoms varied in the three groups, but on the whole the 18 XK cases were the most severe ; the majority suffered from nervous symptoms. Rash, erythema or maculæ, was present in only 22 per cent of the cases and limited to the trunk.

Six cases occurred in the early autumn in the Simla hills. A strain of *Rickettsia* from fleas caught in the area was discovered and passaged, but proved to be in antigenic structure OX19.

Cases of OX₂ serological group occurred mainly in the Southern Command. The seasonal distribution was the same as the OXK group ; the symptoms were similar, but not quite so severe. A maculo-papular rash on the trunk and extremities was present in 85·7 per cent of the cases.

As in 1934, 50 per cent of the OX19 serological group occurred in the Southern Command ; the cases were milder than in the other two groups. An erythema or macular rash was seen in 70 per cent of the cases.

A marked rise of enteric group agglutinins was found. This was most marked in the OXK serological group, and at least 30 per cent of the cases in these groups would have been included in the enteric group if tests had not been simultaneously carried out against the *Proteus* group.

Caution is considered to be necessary in the diagnosis of these cases, as often there are very few symptoms, and therefore it is considered wise to carry out tests for the enteric group of bacilli, except in the presence of definite clinical symptoms or the presence of high agglutinins for the *Proteus* group. In some undoubted cases of the typhus group agglutinins do not reach a higher titre than 1 : 100 ; and in a few proved typhoid cases the agglutinins for the *Proteus* group may reach a titre of 1 : 125 or higher ;

moreover, in some typhus cases the agglutinins for the *Proteus* group may be absent until the establishment of convalescence.

In the section of the Director-General's report dealing with the Special Departments of Medicine, Hygiene, Surgery and Pathology, there are some interesting notes.

In the Department of Medicine it is stated that two small outbreaks of influenza in the Eastern Command were investigated in conjunction with the Medical Research Council and it was found that the outbreak at Shorncliffe was one of true virus influenza, while the larger outbreak in the Woolwich area was not true epidemic influenza. Similar investigations will in future be carried out whenever an outbreak of illness suggestive of virus influenza occurs in the Home Commands.

In the training of young officers with a view to specialization in medicine it has been decided to grade those who show special aptitude or have had experience in certain branches of medicine, so as to enable them to assist, or temporarily replace, recognized specialists. An officer so graded will be assured of special opportunities for work in the subject of his choice and will be expected to sit for the specialist examination at the senior promotion course.

Centres for the detailed examination of cardiac cases have been established in London, Aldershot and Catterick. They have been equipped with electro-cardiographs, and facilities for screening and orthodiagraphy from existing X-ray plants have been arranged. Each centre is supervised by the medical specialist of the area. The location of these centres corresponds to the main recruiting areas and thus a check upon the enlistment of doubtful cases of cardiac disease is readily available. It is anticipated that the centres will help in reducing the number of discharges for cardiac insufficiency among recruits with less than six months' service.

In the Department of Surgery it is stated that 10,068 operations were performed in the year under review; there were sixty-one deaths, which gives a mortality rate for all operation cases of 0.6 per cent.

At Woolwich five cases of acute streptococcal empyema were treated by the closed suction method of drainage described by White in a clinical note in the Journal last year.

During the Quetta earthquake plaster of Paris casts were used for practically all cases of fracture to facilitate their transport. This method was found far superior in comfort, safety and ease of handling to the usual cumbersome "splint" method.

Important additions to the X-ray equipment have been made at the Queen Alexandra Military Hospital, Millbank, the Royal Herbert Hospital, Woolwich, and the Royal Victoria Hospital, Netley.

The grading of junior officers as surgeons, anæsthetists and gynæcolo-

gists was begun in November, 1935. This grading will enable junior officers to be employed and paid as specialists whenever there are vacancies.

In the Department of Hygiene a new departure in barrack construction, known as the Sandhurst Block, has been considered. This type accommodates a battalion under a single roof. The cook house and dining room are in a central position and from them barrack blocks extend on either side. A central boiler provides hot water for baths and ablution rooms, steam for the cookers, and for centrally heating the building. Each small group of barrack rooms has a sitting room and rooms for drying clothes, cleansing equipment and storing suit cases, etc. Each man has in his barrack room a steel wardrobe with ample space for his belongings.

The Report on the Braithwaite uniform and equipment was received in January, 1936. The uniform was well received by the units who carried out the tests, and after some minor alterations have been made it is considered suitable for active service.

Socks treated by a special process to prevent shrinkage were issued to two battalions in the Southern Command for trial during the training season. The socks were worn during marches covering 80 to 100 miles and were washed ten times without showing any shrinkage.

Bug infestation has been a great nuisance in barracks and quarters in the past and most methods except fumigation with hydrocyanic acid have generally failed to destroy the bug and its eggs. In 1935 a proprietary insecticide of the sulphur type was extensively used. It was found easy to apply and it was not necessary to remove the skirting or floor boards. At Woolwich, 523 quarters were disinfested and it was very exceptional for a recurrence to be reported. Out of twenty-four quarters treated at Aldershot during the year, only three required further fumigation. Specimens of bugs' eggs from a quarter which had been fumigated by this method were incubated for fourteen days at the Royal Army Medical College and none hatched out.

In December, 1934, the Army Hygiene Advisory Committee recommended the adoption of the ammonia-chlorine method of water sterilization; this recommendation was approved in April, 1935, and is now the standard method of water purification in the Army. Experiments had shown that the ammonia-chlorine process of sterilization was delayed in alkaline waters, but it was found that sterilization was effected in one hour in an alkaline water with a pH value of 8·5 containing 1 part of urine in 5,000. This was considered satisfactory as no natural waters with an alkalinity greater than pH 8·5 have been recorded in this country and a urinary pollution greater than 1 : 5,000 would render water undrinkable.

In India the ammonia-chlorine method was tested on different samples of water at the Military Food Laboratory, Kasauli, and it was decided to adhere at present to the older method of chlorination for field service.

Experiments have been made with a new clarifying powder for use in the water cart, and a powder consisting of an equal part of Kiesulguhr added to the clarifying powder previously in use has given excellent results, and is now the standard issue. It was, however, discovered that the efficiency of the filter depended on the material of which the filter cloth is made and samples of cloth, to all appearance the same to the naked eye, gave very different results. That known to the Ordnance as "OO" was found to be most satisfactory and has been selected as the standard for future issue.

A small box has been devised to act as a supplementary to the case for testing for poisons in water; it is to be used for testing for the presence of mustard gas in water.

In the Department of Pathology much consultative work has been carried out, and 391 reports have been made on cases submitted for an opinion. This work has been especially concerned with the identification of various varieties of new growth.

During 1935 the investigation into the production of a more effective typhoid vaccine has been pursued in the direction of obtaining a detoxicated product which, while retaining its protective value, would cause less reaction following its administration. The results so far obtained are promising.

Arrangements have been made with the workers of the Medical Research Council who are engaged in research on influenza to provide opportunities to investigate cases of this disease in the Army. As already noted, two small epidemics have been studied, and the virus of influenza has been recovered from a number of the cases at Shorncliffe. The liaison with the Medical Research Council on this subject is being continued.

Vaccines for the Army and the Royal Air Force were prepared in the Vaccine Department, Royal Army Medical College, as in former years. Over 25,000 men, women and children proceeding abroad were inoculated with typhoid-paratyphoid vaccine. This represents that approximately 99 per cent of the troops and their families detailed for service abroad have availed themselves of this preventive measure, although inoculation is entirely on a voluntary basis.

No changes have been made in the arrangements for the medical examination of recruits. The number examined was 45,000, the lowest figure since the Great War. The rate of rejection on primary medical examination shows a definite decrease, while the rate for discharge within six months after enlistment continues much the same. The rate of rejection was 305·7 per 1,000, and the rate of discharge within six months' service 22·1 per 1,000. In the decennial period 1924 to 1933 the rates were 341·95 and 22·69 repeatedly.

During the year an attempt was made to determine the number of

recruits rejected at the various stages of enlistment. Of the number presenting themselves for enlistment 18·8 per cent were rejected by non-medical recruiting staff at sight, 2·8 per cent were rejected by non-medical staff after being presented with Notice Papers and inspected in the recruiting offices. 21·8 per cent were rejected by medical officers.

Total rejections on medical and physical grounds were 43·4 per cent. The corresponding figure for 1934 was about 52 per cent. The rejections at the preliminary examination by a non-medical staff were for obvious defects, such as under standard for height, weight, or chest measurement, severe degrees of defective vision, loss or decay of many teeth, or marked physical deformities.

Diseases of the middle ear still heads the list of the principal causes of rejection for medical defects—48·72 per 1,000.

The average weight of recruits was 130·96 pounds, which is considerably above the minimum standard of 112 pounds. The average gain in weight of recruits on completion of training was 9 pounds.



Echoes of the Past.

MEDICAL ADMINISTRATION IN THE SOUTH AFRICAN WAR.

A COMPLIMENTARY dinner was given to Surgeon-General Jameson, C.B., by the Medical Profession of Great Britain and Ireland on July 24, 1901. After the loyal toasts had been honoured, the Chairman, Sir William Church, President of the College of Physicians, proposed the toast of "The Guest" of the evening, and said that when a very general feeling was expressed that the long and valuable services Surgeon-General Jameson had given to the country should be publicly recognized, it very naturally took the form of a dinner. They had met to do honour to one who had deserved well both of his profession and of the country. After describing the career of Surgeon-General Jameson, the Chairman, continuing, said that in 1896 he was appointed the Director-General of the Army Medical Department. The labours and difficulties that he had had to surmount in that department were known to all. The extreme difficulty of his position, and the arduous character of his labours, put him somewhat in the position of the Israelite of old, because he was asked to make bricks without straw. The present war was unique in its character and difficulties, and never before had so many men left our shores for so great a distance. When the country realized what had to be done, and rose like one man to assist the Government, it was a much easier task for the Government to increase the forces of the country than it was for those whose duty it was to organize the departments which were absolutely necessary for the forces the country was ready to give. The general public had no idea of the difficulties of organizing the hospital service of South Africa. Surgeon-General Jameson had said that all requirements that had been made upon him he had been able to meet, and he thought it reflected the highest possible credit both upon the Surgeon-General and upon his department. They recognized, by the dinner that night, the value of a long life spent in the service of the country, and they recognized still more the constancy with which, amidst labours of the most difficult kind, Surgeon-General Jameson stuck to his post and did good work. As civilians they also wished to acknowledge the able manner in which he had kept up the good relationship between his own Corps and his civilian brethren.

Surgeon-General Jameson in reply said:—

Mr. Chairman and Gentlemen,—I find some difficulty in replying to the toast, and expressing, in adequate terms, my feelings of profound gratitude to the medical profession for the compliment they have paid me this evening, and through me the Royal Army Medical Corps.

It has been my fortune to have been Director-General during a very

eventful period, when a strain has been put upon the Army Medical Service such as has never been put before.

The medical establishment before the war was designedly fixed for two army corps and two cavalry brigades, and it was practically exhausted in the early months of the war, and little remained for hospital duties at home. Events developed rapidly, the Army was doubled, then trebled, and with each unit which embarked, a proportion of medical *personnel* and material had to be provided. Militia regiments were embodied, necessitating fresh demands upon an establishment already impoverished, and soon there began to arrive from South Africa invalids in tens, in hundreds and in thousands. Since the beginning of the war we have received from South Africa, India and the Colonies over 50,000 invalids. All of them were received and handled by us in conjunction with, and ably assisted by, the Quartermaster-General's Department. None were transferred to the civil hospitals; only men on furlough gained access to these, and from first to last the work was performed without a single hitch. But my critics will ask, how could you possibly attend to over 50,000 invalids together with the sick at home, when your establishment had already been expended? That, gentlemen, is the miracle I am about to describe.

At the commencement of the war the strength of the officers was somewhat below the normal establishment. For some years difficulties had been experienced in obtaining medical officers by competition, and when demands were far in excess of establishment, resort had to be made to the system of nomination by colleges and medical schools. These responded readily to the requisitions which I felt compelled to make upon them, and in this manner the establishment was restored to its normal strength, and temporarily increased by 100. In addition, over 700 civil surgeons were enrolled for duty at the front, and a large number in addition were engaged for work in the hospitals at home. I desire on this occasion to acknowledge warmly the readiness with which the medical profession responded to the call. Many of the excellent men who tendered their services have done so at considerable sacrifice. I would particularly mention my obligations to Professor McCall Anderson, of Glasgow, and Professor Cunningham, of Trinity College, Dublin, for willing and effective aid in the matter. In order to recruit the rank and file, we began by calling out the Reservists of the Corps, and that gave temporary relief; then we enlisted men, and trained them as rapidly as possible. The next step was to bring home from the Colonies every man that could be spared. By these means we sent to South Africa nearly 7,000 of our own trained men, and kept a proportion for duty at home. But a further effort had to be made, and we tapped the Militia Medical Staff Corps, which gave us 500 men, 160 of whom went on active service. Then we turned our attention to the Volunteer Medical Staff Corps and the Volunteer Infantry Brigade Bearer Companies, who responded with 600 good men. A number of our pensioners came back, and every civilian with hospital experience that we

could hear of, him we employed. The institution which was the most helpful, outside of our own corps, was the St. John Ambulance Brigade, which gave us 1,900 men, and whenever help was most needed, we applied to this Brigade, and never in vain. It is true that the men for the most part had no previous ward training, but they were willing and intelligent, and with experience they became efficient nurses. The sick attendants of the Langman Hospital were all St. John men. They suffered in a greater degree from the risks of war than any unit in the fighting line, and I state on the authority of Dr. Conan Doyle that 75 per cent of them contracted enteric fever. It will be seen that our difficulties at first were chiefly due to the deficiency of men of our own Corps, and the question arose, who was responsible? The answer is to be found in the report of the Royal Commission appointed to consider and report upon the care and treatment of the sick and wounded in the South African Campaign, in these words: "The deficiency was not the fault of the Director-General and the staff of officers associated with him. They had for a considerable time before the outbreak urged upon the Military authorities the necessity for an increase of the corps, but for the most part without avail."

It has been asserted by a high military authority that the trained soldier is the only article you cannot buy in the open market. This statement is, I think, a little optimistic. You cannot buy the trained hospital orderly, because the article does not exist in any quantity. Experience in this war, on the other hand, tends to prove that a man without much military training may be a very good fighting soldier, Lord Strathcona's Horse for example. In it many men were killed, but no man ever surrendered, and there was no one the Boers had more cause to fear than the rough, untrained, but plucky soldier from Canada, who always fought to a finish.

The deficiency of trained male attendants being acknowledged, this leads to the question, why were not more female nurses employed at the beginning of the War? The answer is simple enough. Every detail of every unit for war purposes is carefully worked out in times of peace. This was done by a committee in which all branches of the War Office were represented, and a scheme was drawn up which met with the approval of the Commander-in-Chief, and was given to us for our information and guidance, showing so many medical officers of different ranks in the unit, so many quartermasters, warrant officers, non-commissioned officers and men, and so many female nurses. It was not business to give up at once a scheme so carefully prepared. I therefore adhered to it so long as trained men could be provided, and when no more were available, we employed female nurses in ever-increasing numbers, and over 800 have gone out to the seat of war, while many are employed at home. It may be stated, however, that in no other European Army has such a liberal provision been made. I have much pleasure in stating that it is to Her Majesty the Queen, and to Her Royal Highness the Princess Christian, that we are indebted

for the supply of such a number of highly-trained and competent nurses. The Army Nursing Reserve was the creation of Her Royal Highness the Princess Christian. The nurses were selected with great care by a committee of which Her Royal Highness was President. They gave most valuable help in many instances at the sacrifice of their own lives, and the failures can be counted on the fingers of one hand.

Hitherto I have referred chiefly to the difficulties in regard to personnel, but as professional men and taxpayers, you may be interested in knowing what was done in reference to material.

The normal annual expenditure for medicines, etc., is about £14,000. We increased it to £198,000. The whole medical vote, excluding the non-effective vote in normal times, is about £300,000 a year. Last year we spent over a million. Since the war began we have sent out 4,000 shipping tons of medicines and surgical material. We have mobilized 151 staff and regimental units, 19 bearer companies, 28 field hospitals, 5 stationary hospitals, 16 general hospitals, 2 hospital ships, 3 hospital trains, 3 advance, and 2 base depots of medical stores. In addition, many units were organized in South Africa with men and material provided from home. Among the stores sent out were 19 X-ray apparatus and outfits for 4 dental surgeons. Over and above these we have provided large quantities of material for the use of the China Field Force.

In a recent telegram, the principal Medical Officer in South Africa reported that he had nearly 21,000 hospital beds equipped, exclusive of the accommodation in field hospitals, and of that number only 600 beds are in private hospitals.

When one recalls that the grand total of hospital accommodation in London is only some 30,000, and that that figure not only includes the numerous small hospitals, the great general hospitals, but the hospitals of the Metropolitan Board and the Poor Law Infirmarys, I think the magnitude of our undertaking will be realized.

The assistance given us by the private hospitals organized in this country for war service, was most opportune. These hospitals were splendidly equipped, and the nation owes a deep debt of gratitude to all those who gave so bountifully of their means, their time, and their services. They were the Yeomanry, the Portland, the Langman, the Moseley, the Van Allen, the Irish, and the two Scottish hospitals. Nor must it be forgotten that one of the most perfect medical units was sent from New South Wales.

It is not, I think, very well understood by some of our critics what our responsibilities are as regards supply. Food and so-called hospital comforts are supplied on requisition by the Army Service Corps, while all hospital equipment, beds, blankets, mattresses, hospital clothing, utensils, furniture, etc., are, or should be, provided by the Ordnance Department, and when you hear of such things being wanting, the blame, if any, does not rest with us. It is true that we were compelled at Bloemfontein to commandeer

things, and this was done extensively, because there was not a single Ordnance Officer present until ten days after its occupation. Then as regards ablution arrangements and the washing of hospital clothing, if unsatisfactory, the blame should not have been cast upon the Medical Department. Again, we were criticized for defective sanitary arrangements in the field, in face of the fact that the post of Sanitary Officer had been abolished against medical advice, and the over-worked Principal Medical Officers had to be their own sanitary officers. The selection of sites for camps and hospitals is a duty devolving upon the Quartermaster-General's Department, and expert advice may or may not be asked, or it may be ignored. And in respect to taking over buildings for temporary hospitals, in no instance, as far as I am aware, was any building taken over by the Barrack Department or the Royal Engineers, the very department organized for the purpose. The Royal Army Medical Corps, from necessity, not only had to take over buildings, but also in numerous instances, undertake structural alterations and equipment at a time when their services were urgently needed in their own sphere.

The care of the sick and wounded, if conducted on humanitarian principles in the future, will require an enormous increase of transport, and this is what never will be given, or if given, it is certain to be taken away in favour of food and ammunition when the necessity arises. Lord Roberts, in his evidence before the Royal Commission, stated that, for a whole month at Bloemfontein, he had not a single day's food in the larder, that he was dependent for his supplies on a single line of railway cut in places, and the enemy close down on the frontier of Cape Colony. Any accident or serious reverse would have cut him off from his supplies altogether. Is it likely, then, that the chief of the staff, with starvation staring him in the face, would give much heed to the supply of hospital utensils? Lord Roberts' evidence is, in my opinion, a complete answer to every complaint.

The confidential reports by General Officers upon our officers on active service, are almost, without exception, most flattering, and it is a pity that such reports are treated so confidentially. Zeal, devotion to duty, good professional work, are the characteristic features described. It is to be hoped then, that with a better knowledge of character, the estrangement which has unhappily existed for some time between combatant and medical officers, and which has found expression in a social direction, will disappear. It is to the Medical Service, rather than to individuals, that this unfriendly feeling is displayed, and this is generally looked upon as a protest by combatant officers of junior rank, against the abolition of the regimental system of which they have had no experience; or perhaps it is the protest against the creation of a Royal Corps with rank and titles equal to their own. If so, it is not in accordance with the best traditions of the English officer. Personally, I have no cause to complain, and never had; my oldest and dearest friends are combatant officers. In my five years'

service in the War Office as Director-General, nothing could exceed the kindness and courtesy shown me on all occasions by all the Officers of the Headquarter's Staff, and conspicuous in urbanity has been the Adjutant-General, Sir Evelyn Wood.

But the Medical Department is looked upon as a kind of excrescence of the War Office. It is not upon the same equality as that of the Royal Engineers, for example. The Director-General, unlike the Inspector-General of Fortifications, is not a member of the War Office Council, presided over by the Secretary of State, or of the Army Board, presided over by the Commander-in-Chief. He attends their meetings when summoned, but subjects concerning his department may be discussed in his absence, and, as has sometimes happened, he may get a knowledge of their decisions after some delay. There are few subjects, I imagine, discussed in which the health and comfort of the soldier is not directly or indirectly concerned, and when one considers that in war disease is always more fatal than gunshot, and that a tenth part of the Army is every day under the command of the Medical Department, the wisdom of the Director-General's exclusion from these Boards is not apparent.

A short time ago I was present at a complimentary dinner given to two distinguished gentlemen who were vacating their appointments in the War Office. There was much after dinner speaking and much praise was bestowed on individuals in the various branches, and I have no doubt deservedly. There was much praise of the Military Secretary's branch, Adjutant-General's branch, Quartermaster-General's branch, Ordnance branch, Royal Engineers, Financial branch, Contracts' branch, and of clerical work generally, but from first to last no mention was made of the Medical branch, and when I think of it, nor of the Chaplain's department either, from which it may be inferred that the care of souls and bodies is not held of much account in Pall Mall.

During the war, no General Officer has equalled Sir Redvers Buller in the generous expression of his appreciation of the work done by the Army Medical Service. I remember well the first interview I had with him after my appointment, for it characterizes the man. After some conversation, he said: "Before you go let me give you a bit of advice. It is this: Whoever opposes you, never mind who it is, high or low, stand up for your own department." Gentlemen, I followed that advice, as men usually follow advice which agrees with their own inclinations. I acknowledge there has been an abundance of opportunity given me for standing up, and when our officers and men, after superhuman efforts on their part, find themselves subjected to criticism and to an inquiry such as has not been applied to any other part of the Army, and to blame which others should bear, it is not surprising that in all ranks of our Corps the idea prevails that justice has not been done. And the sympathy which others have denied, but which you have shown by your presence here this evening, will be all the more esteemed.

I sincerely trust that in the changes which are under consideration, by a committee in which, by the way, the Medical Department is but feebly represented in numbers and voting power, our organization may not be disturbed. It was developed by that liberal-minded statesman, Lord Landsdowne. It is prized by us, and has created *esprit de corps*, stimulating us to work up to our motto, "In arduis fidelis." The most urgent want now, and for years past, is an increase in the personnel, and given that increase, leave for study and a due proportion of home service will become possible, but to obtain that increase the Service must be made more attractive in one way or another. Even with the difficulties that existed in South Africa, which I have attempted to describe—and they were mainly due to military exigencies—I take consolation from the conclusion of the Royal Commission's report: "And all witnesses of experience in other wars are practically unanimous in the view, that taking it all in all, in no campaign have the sick and wounded been so well looked after as they have been in this." That is the verdict given after an exhaustive trial, and when the history of the war is written, that verdict, I am convinced, will be upheld.

Sir William MacCormac, President of the Royal College of Surgeons, England, in proposing the toast of "The Public Medical Services," observed that it seemed to be a matter of course that after every war an inquiry into the medical arrangements should be held. The Royal Commission sent to South Africa had found some minor defects, but on the whole its report was most favourable. But incompetent critics were not satisfied, and the effect of the injustice with which the Service had been treated was shown by the fact that there was at the present moment not a single candidate applying for admission to His Majesty's Medical Service. He thought it was impossible to say too much in the way of admiration of how Surgeon-General Jameson had met every requirement that had been made on him.

WAR EXPERIENCES OF A TERRITORIAL MEDICAL OFFICER.

BY MAJOR-GENERAL SIR RICHARD LUCE, K.C.M.G., C.B., M.B., F.R.C.S.

(Continued from page 281.)

CHAPTER XXII.—THE EXPEDITION ACROSS THE JORDAN.

At the time of my return the Corps was busy with plans for further activities. The new operation was in the eastern direction again and took the form of a fairly extensive raid. It was intended, if the move were successful, that we should hold on to part at least of the country occupied.

As has already been mentioned, we were now holding the western half of the Jordan Valley, from the Dead Sea to the Wadi Auja.

The Jordan, roughly, runs down the middle of the valley which at this part is about fourteen miles across and an almost flat plain. Jericho, the

only village of any size, is about five miles west of the Jordan, and therefore about two from the foot of the western hills.

Seven miles to the east of the Jordan the ground begins to rise rapidly again. As seen from the Mount of Olives, this rise looks in the distance like a wall, and constitutes the well-marked feature of the view across the Jordan known as the Mountains of Moab. In reality, though steep, it does not constitute an abrupt rise and is broken by wadis running down through it, up which there are a few rough tracks. There is only one real road. This is continuous with that which passing through Jericho crossed the Jordan by an iron bridge at a point known as Ghoraniyeh. The Turks had entirely destroyed this bridge in their retreat across the Jordan.

The road strikes the hills at a small village called Shunit Nimrin, where a well-marked wadi with a stream meets the plain from the hills. The road which is macadamized and well engineered, makes its way up the valley formed by this stream, and after about twelve miles ascent in a north-easterly direction reaches the top of the plateau at the town of Es Salt. This place, before the War, had a population of about fifteen thousand, of whom about four thousand were Christians. There was an English Mission Station there with an English doctor. The people are wild and fanatical, but well to do. From Es Salt the road crosses the high ground of Moab in a south-easterly direction for about twenty miles, until it meets the Hedjaz Railway at Amman. The railway comes down from Damascus and for the whole of its course keeps close to the desert margin.

Amman is the site of the Rabbah of Ammon of the Old Testament, besieged by Joab, David's captain (2 Samuel xii. 26-31), and eventually taken by him. David came over from Jerusalem to make the triumphal entry. This siege was the occasion of the disgraceful doing to death of Uriah, the Hittite, who was purposely put into the forefront that he might meet his end and no longer stand in the way of the king's lascivious design.

The idea of the operation in view was firstly to force the crossing of the Jordan, then to push rapidly up the hills to Es Salt, and finally the mounted troops were to make a raid on Amman and cut the railway at that point.

The troops detailed were the 60th Division with one brigade of the 53rd Division attached, and the Anzac Mounted Division. The command of the expedition was in the hands of Major-General Shea, G.O.C. of the 60th Division.

The Jordan, at this part of its course, is a very tortuous stream lying in a deep bed, and is lined on either side by a belt of undergrowth. Outside this is a series of white chalky hillocks formed by chalk deposits, referred to in the Bible as the "slime pits," a name which well describes the character of the ground during the rainy season. At this time of the year the river was not fordable and the stream was muddy and rapid. It varied in width from about fifteen to twenty yards.

It was originally intended to cross the river in three places. The main crossing was to be at Ghoraniyeh, where the Turkish bridge was built; another about six miles further down at Makhadet Hajla, and a third at a ford higher up.

Makhadet Hajla is the supposed site of the baptism of Christ by John the Baptist, and one of the regular places visited by pilgrims.

The operation began on March 21. Owing to the rapid flow of the stream the main crossing failed, but after considerable difficulty a crossing was effected at Makhadet Hajla. An officer swam across with a line and a party followed in a punt without being discovered; a pontoon bridge was fixed which enabled a force to get over and establish a "bridgehead."

I paid a visit to the field ambulances in the Jordan Valley on March 22, to meet the D.M.S., General Swan, and found everything working smoothly.

With the A.D.M.S. 60th Division and the O.C. 2/4th London Field Ambulance I went down to the Jordan banks at Makhadet Hajla and found a steady stream of casualties being brought across from the bridgehead which had just been established. It was easy to see how difficult a piece of work it had been to establish a crossing. The river almost up to the level of its banks was racing down, carrying in its current much floating and suspended matter. The Turks were only just across the other side, and there was an absolutely continuous rattle of machine-gun and rifle fire from both sides. The 79th Brigade of the 60th Division were nearly all across and the 80th were on their way down to join them. None of the cavalry were yet across. It was not till the following morning that the New Zealanders crossed and by a splendid rush cleared the east bank as far as Ghoraniyeh in time for the new bridge which was now being constructed there.

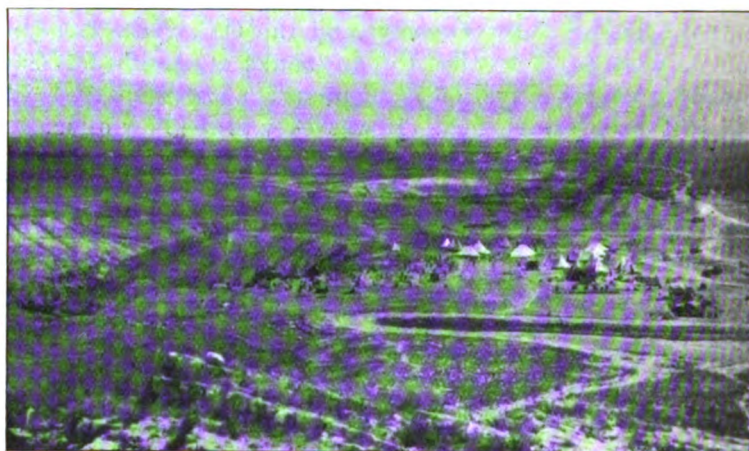
The push forward to Shunet Nimrin did not begin till March 25. The advance was rapid after a short resistance at the foot-hills at Shunet Nimrin. The Turks retired precipitately and allowed our troops to move up the valley without further opposition. Es Salt was occupied and the two brigades of the Anzac Division moved on to Amman with one brigade of the 60th Division.

After four days of heavy fighting the small force was unable to capture the town of Amman, though they managed to destroy pieces of the railway both north and south.

As fresh Turkish reinforcements were reaching Amman from the north, and also as Es Salt was threatened from across the Jordan, it was decided to withdraw the whole force in the night of March 30. The retreat was a very arduous one especially for the medical units who had to carry all their casualties with them; every available vehicle and camel was utilized for carriage of wounded. All the wounded were got away except two belonging to the Anzac Division who were too ill to be moved. The state of the roads, owing to the exceptionally bad weather made this one of the most

difficult pieces of medical work that had faced us. The arrangements were in the hands of the A.D.M.S. 60th Division, Colonel Dowsett, and reflect the greatest credit on him.

I visited the valley on the 29th and crossing at Ghoraniyeh, made my way to Shunet Nimrin, where the 2/5th London Field Ambulance had a dressing station. I made an attempt to get on up to Es Salt, which was then in our hands. It had rained heavily on the 25th and 26th and though beautifully fine that day, the state of the roads was terrible. After getting about six miles up the road, out of the twelve to be traversed, I was obliged to turn back as my Ford could get no further. The road, like all the Turkish ones of recent construction, is well designed but badly carried out. The soft stone of the country will not stand traffic in bad weather, and in this case had been churned up into mud often eight or nine inches deep.



2/4th Field Ambulance Camp near Jericho.

The valley of the Nimrin, up which the road winds, is very beautiful and at this time of the year was luxuriant with wild flowers.

Palestine in springtime is famous for its wild flowers, and certainly in the spring of 1918 it did not belie its reputation. Within a radius of not more than ten yards while eating my lunch one day by the roadside between Jerusalem and Ramleh I picked more than thirty varieties. It is not so much the number of varieties as the mass of varied and brilliant colour that gives its charm. The flower season, however, is short; six weeks and it is all over. There is no rain after April and the drought soon reduces the landscape to one of bare rocks with a tinge of reddish brown where there are deposits of the red fertile soil which lines the valleys and the hollows of the grey limestone hills.

The 2/4th Field Ambulance commanded by Lieutenant-Colonel Layton stationed at the foot of the hills on the Jerusalem side of the Jordan valley had been specially equipped with tents and a surgical operating unit. Serious

cases were dealt with there and retained comfortably in bed until they were fit to be moved back to Jerusalem. The entire distance from Amman to the nearest casualty clearing station at Jerusalem was over fifty miles. Cars could not be used beyond Es Salt and were available only for a small proportion of the casualties beyond the Jordan.

By the night of April 2 the total number of casualties, sick and wounded, evacuated during this expedition was one thousand, eight hundred and eighty-six.

Nine hundred and eighty-six prisoners were taken and a large number of Christian refugees, for whom accommodation had to be found in and around Jerusalem, came away with the troops from Es Salt for fear of reprisals.

After this the responsibility for the Jordan Valley was handed over to the Desert Corps, who conducted the next attempt across the Jordan a month later. In this the 60th Division were again employed, but under the directions of the staff of the Desert Corps. It was less successful than the first, as although the mounted troops, using a more northern route, managed to occupy Es Salt, the Turks who had been strongly reinforced could not be driven out of Shunet Nimrin.

April brought about great changes in the Egyptian Expeditionary Force.

The German advances on the Somme raised a great cry for reinforcements in France, and General Allenby had to part with a large proportion of his best troops at the very time that he was meditating and preparing for a further advance.

The 20th Corps lost the 74th Division on April 23, and the 21st Corps the 52nd, Lowland, Division. Besides the loss of these complete divisions preparations were made to part with twenty-five battalions from the other divisions and fill their places with Indian troops, many of whom at the time of their arrival were only half trained. All the divisions, except the 54th, belonging to the 21st Corps, were to be reconstructed on a mixed basis. Each infantry brigade was to consist of three Indian and one British battalion. The cavalry was to be changed in the same way, but to a less extent, as the Australian and New Zealand Mounted Brigades remained untouched. The artillery was left intact, except in the case of some of their drivers.

The changes profoundly affected the medical organizations. All our field ambulances had to be reconstructed and we had to part with a large proportion of our well-tried British personnel, and receive in their place for the most part raw drafts of Indians, most of whom were quite uneducated, and many of whom had not even been taught the rudiments of drill. They had, moreover, been recruited from all over India, and spoke many different languages. The best establishment for a field ambulance to do the medical work for a mixed division of the nature described above was a vexed and debated question.

The pre-War arrangement in India, where mixed brigades were the usual system, had been found hopelessly unsuitable when it came to bear the test of active service in Mesopotamia, as anyone with any grasp of the use of field ambulances in war might have foreseen.

To each Indian division were allotted four field ambulances, one British and three Indian, each equipped to look after the troops of their own race only.

It ought to have been obvious to anyone who had ever served with a field ambulance that this was quite unworkable in the field. If it is to be of any use a field ambulance must be in very close contact with the troops it is serving. By the mixed brigade system the British troops will be scattered all over the area occupied by a division during operations. To expect the one British field ambulance to deal with casualties from the whole of a division in action is obviously impossible. In consequence of the discovery of the impracticability of this arrangement when the Indian Army went to Mesopotamia, an alteration was made and a mixed unit known as a Combined Indian Field Ambulance was formed. This unit consisted of four sections, one British and three Indian. Three combined Indian field ambulances were allotted to each division. This was an improvement, but did not go far enough, because field ambulances practically always have to be split up on active service, and each separate part must be able to deal with both British and Indian soldiers. It is essential, therefore, that each section of a field ambulance should be organized on a mixed basis, and in the 20th Corps we drew up an establishment providing for this and obtained permission to use it provisionally. The British personnel of the British section was divided among the other three sections so as to make three composite ones.

The Indians make excellent stretcher bearers; they are brave, untiring and devoted, but from their lack of education can never be taught more than the barest rudiments of first-aid and nursing. Whereas the men that formed our old Territorial and New Army field ambulances had become quite first rate in both. The combination, when thoroughly shaken together, formed a really satisfactory unit, but it took time, tact and hard work to bring about the final result, especially as none of the new units had more than two officers who could speak to their Indian troops in their own language. Besides the language question there were great difficulties in some units in the matter of caste. No high caste Hindu will eat food that is prepared or handled by one of a lower caste. Each detachment working by itself has therefore to be provided with a cook of the right caste for the Hindus and another for the Mohammedans. On the other hand no high caste man will do any menial office for a patient so that a proportion of low caste men must also be provided for those duties. In practice things did not work out as badly as might be expected. The Indian, strong in his religious beliefs and very tenacious of maintaining his customs as far as they can be maintained, is not as a rule unwilling to do his bit in a tight

place, even though he may have to break some caste rule, for which he hopes to get absolution afterwards. The one thing necessary was that the officers should show they were in sympathy with the caste rules of their men and that they should do what was humanly possible to make the observance of such rules practicable.

It must be remembered that this formation of new units had to be done in the face of an enemy, while all the routine work of evacuation of sick and wounded from the front line to the casualty clearing station was going on as usual. It was never possible save on rare occasions to get the whole unit together for training which had, therefore, to be done spasmodically, piecemeal and by actual practice in the field. That so good a result was obtained in the few short months available before active operations were recommenced speaks volumes for the commanding officers and all their subordinates, British and Indian, who had to bear the brunt of the training work. I must say that when I first inspected some of the raw levies that came to us from India in the guise of organized field ambulances and compared them with the splendid highly trained material we were giving up to be converted into infantry, my heart sank within me, and I looked forward with the greatest anxiety to the day when the lives of our wounded and our own medical reputation would be in their hands. But as time went on patience and perseverance worked miracles. The majority of Indians are natural soldiers. Bravery, endurance and discipline are inherent and they only require good leading to be moulded into that shape which the mind of the leader has set up as his ideal. When the time of trial did come these units did not fail. They had great difficulties and strenuous work to face, but they got through without bringing discredit on the Service which is always open to criticism, and for which few allowances are made, even when much more is asked of it than is provided for in the book. Another difficulty in the new reorganization was the provision of a proper regimental service. According to the Indian establishment each battalion should have, in addition to its medical officer, an assistant surgeon, a grade of unqualified but highly trained dispensers, peculiar to India, who are capable of treating minor ailments and whose ministrations are not scorned even by Europeans in emergency. Unfortunately there were practically none of these available for the battalions that came to us. The civilian Indian dispensers, who were sent in very insufficient numbers to take their place, were practically useless. Also, too many of the Indian civil medical officers who came with the new troops were of very poor type and in some cases could hardly be trusted to go into action with their units. At length we obtained the concession that an R.A.M.C. corporal should be attached to each Indian unit to assist the medical officer and to take charge of and train the regimental stretcher bearers. This was a great help and though the N.C.O.'s position was a little difficult as he was often the only British N.C.O. in the unit, the system worked well. To get this concession from the autocrats who were directing the man power scheme and who had

little sympathy with the difficulties of medical administration, was like drawing blood out of a stone, but it was accomplished at last. It must be said in fairness that some of the civil Indian medical officers were most excellent and both in camp and in action maintained as high a standard of medical efficiency as was to be found in the best British units. No regular I.M.S. Officer, British or Indian, could be spared for regimental work, as they were all required for service in the field ambulances and hospitals.

(To be continued.)

Current Literature.

DUKE, H. L. **Some Recent Advances in the Biology of the Trypanosomes of Sleeping Sickness.** League of Nations. Epidemiological Report of the Health Section of the Secretariat. Nos. 10-12, 1936.

The author states that in spite of the uncertainty that still surrounds some of the major problems of human trypanosomiasis there are certain clear indications to direct those called upon to administer the infected territories in Africa.

It is clear that man must be protected not only from *G. palpalis*, but from game-feeding tsetse. In *palpalis* areas the control of sleeping sickness is simply a question of breaking contact between tsetse and man. The enormous numbers of affected people and the wide distribution of this tsetse along streams and rivers are the main obstacles to success. In game-tsetse areas the problem is not so difficult as the population affected is nothing like so extensive. Human settlement in game country must be protected from game tsetse. Where settlement is necessary in game-tsetse areas the game must be exterminated as part of the measures to ensure protection of the population against game tsetse.

Isolated settlements in areas mainly given over to tsetse supply the conditions favourable to the appearance of *T. rhodesiense*. Settlements in the vicinity of game tsetse should be under a form of supervision by which the natives are enabled to co-operate with the authorities to ensure their own protection. Experience in the Congo, in Tanganyika and the Southern Sudan has shown how much can be effected by concentration of scattered settlements in the campaign against tsetse.

Game preserves must be properly defined and measures devised to supervise visitors, black and white, who are liable to exposure to tsetse. The value of Bayer 205 as a prophylactic against infection must be borne in mind.

Simultaneously with measures to break contact between population and tsetse, there must be organization of the resources of the territories to ensure proper agricultural development.

Endemic sleeping sickness is a disease associated with poverty, inadequate food, poor physique and low resistance. The native's standard of living must be improved and he must be taught the elements of sanitation; the admirable results attained in the Belgian Congo and in Tanganyika will then follow in due course.

Antityphoid Inoculation in Armies: International Inquiries. Archives Médicales Belges—publishing the *Journal of the International Congress of Military Medicine and Pharmacy*, No. 11, November, 1936.

In Yugo-Slavia anti-inoculation is carried out with a mixed vaccine containing per cubic centimetre, 1,200 million typhoid bacilli, 250 million paratyphoid A, and 500 million paratyphoid B. The vaccine is prepared from six strains of typhoid bacilli, two strains of para A and four strains of para B. All the strains are obtained by blood culture from cases in different garrisons: some from cases which have succumbed to typhoid infection. All the strains have the characteristics of S-cultures (smooth).

The antigenic properties of the typhoid strains chosen for the T.A.B. vaccine are tested by agglutination with sera which agglutinate typhoid bacilli, the bacillus of Gärtner, Jena, and the *Bacillus paratyphoid* C, Munich. All the strains have the "H" and "O" factors well developed, and when inoculated into rabbits produce a high degree of "O" agglutinins. Vi-antigen content has not been tested. The toxicity and virulence of the bacilli have not been determined. The vaccine is sterilized by heat (54° C. for the typhoid bacillus, 57° C. for the paratyphoid A and 58° C. for para B). After heating, 0.5 per cent. of carbolic acid is added to the emulsion.

Antityphoid inoculation is carried out by two injections, the first 0.50 cubic centimetre and the second 1 cubic centimetre. Recruits are inoculated immediately they are called up. It is laid down in Regulations that soldiers will not be called upon to perform any heavy work on the day before the inoculation and they will be excused duty for forty-eight hours after.

The T.A.B. vaccine causes severe local reactions and mild general reaction. Soldiers are allowed to rest in bed. Reinoculation is carried out usually six months after the original inoculation, and consists of one injection of 1 cubic centimetre of the vaccine.

Reviews.

PRACTICAL METHODS IN THE DIAGNOSIS AND TREATMENT OF VENEREAL DISEASES. By David Lees, D.S.O., M.A., M.B., D.P.H., F.R.C.S.(Edin.), F.R.C.P.(Edin.), F.R.S.E. Edinburgh: E. and S. Livingstone. 1937. xvi + 608. Price 15s. net.

The third edition (1937) of the late Dr. David Lees's "Diagnosis and Treatment of Venereal Diseases" is a tribute to his memory, edited and revised by Robert Lees, with additional contributions by Drs. R. Cranston Low, W. R. Logan and R. C. L. Batchelor.

This manual, while not professing to be a work of reference, contains all that is essential for the student and the practitioner; the information is set forth in a clear and practical manner and includes references to recent advances without adding to the size of the volume.

Notes on paradenitis have been added in Chapter XIII of this edition, and it is observed that the principles of antisyphilitic treatment enunciated by the author are in conformity with those advocated by the League of Nations Health Committee in the *British Medical Journal* of May 18, 1935.

The index has been cut down from 28 pages to 14 without any loss of efficiency, and a useful addition has been made in the form of an Appendix giving addresses of V.D. Treatment Centres in the main seaports throughout the globe.

J. M. E.

MONOGRAPH ON PHYSIOLOGY—ABSORPTION FROM THE INTESTINE. By F. Verzář, assisted by E. J. McDougall, Ph.D. London: Longmans, Green and Co., Ltd. 1936. Pp. xii + 294. Price 21s. net.

In this monograph of 300 pages the authors describe the present state of knowledge on absorption from the intestine gained from personal experience while working on various problems in this field during the last ten years.

They have shown that it is mainly diffusion which explains the entrance of water-soluble substance into the mucosa, and that the movement of water out of and into the intestine obeys the law of osmosis. In the large gut, when the contents are in osmotic and diffusion equilibrium with the blood, absorption is brought about by filtration, owing to the high hydrostatic pressure to which they are subjected. Diffusion, however, is only possible when the digestive processes have presented the substances in aqueous or lipoid solution.

In the absorption of certain substances there is a special selective advantage which seems to be completely contrary to physical laws. These

favoured substances are ones which are especially used in the metabolism of the body and the specific selectivity is the result of active life-processes in the mucosal cells. Glucose and galactose are examples of such substances. They are absorbed from any concentration with a velocity which represents the greatest possible permeability of the mucosæ for molecules of this size. The authors have recognized this activity process as a phosphorylation of these two sugars, which occurs after their diffusion into the mucosal cells. Through the constant transformation of the diffusing substance the diffusion gradient is kept high and this synthesis finally acts by increasing the diffusion process, and hence the velocity of absorption. Similar action plays an important part in fat absorption. Finally, they have found that the phosphorylation processes in the intestinal mucosa are under the influence of the hormones of the adrenal cortex. If this cortex is destroyed, the selective absorption of glucose and fats is abolished.

These views on absorption are of great interest and may be of help in elucidating various digestive problems, tropical and otherwise.

A. G. B.

TROPICAL DISEASES BULLETIN SUPPLEMENT. Vol. 33, October, 1936.

Medical and Sanitary Reports from British Colonies of Protectorates and Dependencies for the Year, 1934.

Granville Edge has, by careful selection, succeeded in making a very useful précis of the fifty and more medical and sanitary reports relating to the widely scattered territories comprising the British Colonial Empire. A wealth of accumulated scientific experiences is contained in the original reports but, unfortunately, owing to their length they are studied by far too few.

This précis enables those interested to get the salient features of each in a conveniently small space. Where any matter of special interest is discovered the original can then be consulted. This supplement should be studied by those who cannot find time to read the original reports.

A. G. B.



Notices.

THE HEALTH CONGRESS OF THE ROYAL SANITARY INSTITUTE.

THE preliminary programme of the Health Congress, which is to be held at Birmingham from July 12 to 17, 1937, has recently been issued.

The following comprehensive list of subjects will be discussed at the Congress :—

The Development of the Maternity Service	Detection of Diseased Lesions in Offal and Carcasses of Animals Slaughtered for Food
Care of the Pre-School Child	Value of Medical Services to Industry
The Future of Our Population	Practical Application of Physiology to Hygiene in Industry
Physical Education	Water Pollution Research and Waste Waters from the Milk Industry
Incapacitating Sickness	Rationalization of Sewage Disposal
Social Insurance and Citizenship	The Work of the Tame Basin Joint Committee
Health Education and the Insured Person	Salvage Operations in Refuse Disposal
Health Education of the School Child	The Shops Acts
Antimalarial Marsh Reclamation and Drainage	Holiday Camps
Health of Women and Children in Malaya	Disinfestation of Furniture
Soil Sanitation in the Tropics	Slum Clearance
Town Planning	The Work of Health Visitors
Housing Progress and Prospects	
Safeguarding of Bulk Milk	

The Earl of Dudley is the President of the Congress, and he will deliver an Inaugural Address. The Minister of Health, Sir Kingsley Wood, will also address a general session of the Congress.

UNIVERSITY OF LONDON.

SPECIAL UNIVERSITY LECTURES IN CHEMISTRY.

A COURSE of three lectures on "The Chemistry of the Carotenoids and Vitamin A" will be given in the Chemistry Lecture Theatre of the Imperial College of Science and Technology, Imperial Institute Road, South Kensington, S.W.7, by Professor I. M. Heilbron, D.S.O., F.R.S., Sir Samuel Hall Professor of Chemistry and Director of the Chemical Laboratories, University of Manchester, at 5.30 p.m. on May 24, 25 and 26, 1937.

Syllabus.

Lectures I. and II.—Historical Introduction : General Characteristics of the Carotenoid Pigments ; Methods of Isolation and Purification ; Chromatography ; Spectroscopy ; Structures of Individual Plant and Animal Carotenoids.

Lecture III.—The Chemistry of Vitamin A.

At the first lecture the Chair will be taken by Professor Jocelyn F. Thorpe, C.B.E., D.Sc., F.R.S., Professor of Organic Chemistry in the University.

The lectures which will be illustrated with lantern slides, are addressed to students of the University and to others interested in the subject. Admission free, without ticket.

S. J. WORSLEY,
Academic Registrar.

SPECIAL UNIVERSITY LECTURES IN ANATOMY.

A COURSE of three lectures on "The Meninges and the Cerebrospinal Fluid," will be given at University College, London, Gower Street, W.C.1, by Professor Lewis H. Weed, Director of the School of Medicine and Professor of Anatomy in the Johns Hopkins University, Baltimore, at 5.30 p.m. on May 24, 26 and 28, 1937.

Syllabus.

Lecture I.—Introduction; Statement of Problem; Gross Anatomy and Histology of Ventriculo-Meningeal System; Production of Cerebrospinal Fluid with Evidence of Origin from Choroid Plexuses and Perivascular Spaces.

Lecture II.—Circulation of Cerebrospinal Fluid through Cerebral Ventricles and Meningeal Spaces; Absorption of the Fluid, with discussion of Anatomical Pathway and Analysis of Forces Concerned; Pressure of the Fluid, with its Relationship to Intracranial Venous Pressure.

Lecture III.—The Munro-Kellie Doctrine of Fixed Intracranial Volume; Consideration of Cranio-vertebral System as Rigid Container, with Experimental Evidence from Hypertonic Solutions and Positional Change; General Discussion of Cerebrospinal Fluid in the Meningeal Bed.

At the first lecture the Chair will be taken by Professor H. H. Woollard, D.Sc., M.D., B.S., Professor of Anatomy in the University.

The Lectures, which will be illustrated with lantern slides, are addressed to students of the University and to others interested in the subject. Admission free, without ticket.

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"TABLOID" GUIDE TO PHOTOGRAPHY.

THIS is the title of an interesting and informative little work which explains, step by step, the development of the exposed film to the production of prints and enlargements. Intended for the beginner, the language is simple and non-technical, but those who have already processed their own materials may well derive benefit from the methodical steps suggested. The booklet is priced at 2d. but readers can obtain one free of charge by mentioning this Journal in their application which should be made to Burroughs Wellcome and Co., Snow Hill Buildings, London, E.C.1.

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**NOTES ON A SUGGESTED EXPLANATION OF THE
ANOMALIES IN THE SITUATION REGARDING THE
PREVALENCE OF ANXIETY CONDITIONS.**

BY COLONEL H. GALL.

CONDITIONS of morbid anxiety have become everywhere commoner in recent years, and this is reflected in their prevalence in the Services. In assessing the possible influence of service life and conditions on their production this general increase outside the Services must not be lost to view.

The most widely held theory of the origin of a neurosis is that such a condition is the result of abnormal evolution of the sexual component of the libido, some portion thereof becoming fixed at an infantile level, thus leaving a weakened libido which may be unable to contend successfully with frustration and stress. In these circumstances the libido as a whole may regress to infantile levels, and infantile eroticism will then be expressed in terms of psychotic or neurotic symptoms.

Freud himself places neurasthenia and anxiety neurosis on a different footing to other neuroses and attributes them to somatic sexual disorder. However, different people mean somewhat different things by the term anxiety neurosis, and I do not think that such a causal factor as coitus interruptus is of importance in the majority of the cases recorded in the Army as anxiety neurosis.

I think that to most psychiatrists conditions of morbid anxiety suggest

some underlying disharmony between the libido and the ego which weakens mental resistance to worry and stress.

The increase in morbid anxiety conditions referred to above is a phenomenon of this century which began to be apparent early therein. As far as the Army is concerned anxiety conditions were for practical purposes unknown at the beginning of the century. However, as the century passed through its opening years these cases began to appear and were becoming common before the late war and in countries unaffected by the war.

The explanation which is usually accepted as accounting in large measure for their causation in military cases is that military duties have tended to become very much more arduous and exacting in recent years and that anxieties in connexion with promotion in these days of economic stress are often acute.

There have been constant changes and reorganizations, and senior ranks, both commissioned and other, have to shoulder heavy responsibilities in connexion with big contracts and estimates and the custody and maintenance of valuable stores, etc. Long journeys occupying valuable time have to be undertaken on inspection duties and often under bad conditions of climate. All this is true enough and of much importance, but anxiety conditions, though naturally commoner among those thus severely tried, are so comparatively common now among officers and others with no great responsibilities, bachelors without family worries, etc., that the above factors become in considerable measure invalidated as a primary cause.

In some ways it is obvious that the military life remains, as it always has been, a sheltered one compared with many civilian callings. Its prospects may not on the average be brilliant, but are up to a point safe and permanent, immune from the current depression and insured against loss of employment as a result of even quite severe and prolonged sickness.

I think that on the whole it is felt that the prevalence is not quite to be explained by such considerations as the above, which seem incapable of explaining an accumulation of cases threatening to become an administrative problem. On the other hand, the man who develops morbid anxiety finds any work difficult and is liable to give an exaggerated account of its difficulty. However, in my experience, not a few of these cases admit that their work is not particularly difficult and is not a great anxiety to them.

Then there are other factors in the case. One of these is that this increase in these neurotic conditions has coincided with an increase in certain other conditions, both mental and physical. As regards mental conditions, the clinical aspect of psychiatry has changed in odd ways during recent years. Psychotic breakdowns have become commoner, but a considerable component of this increase has been composed of a new type of minor breakdown which deserves to be so called not because it is not acute but because it is evanescent and often seems to leave no ill-effects. In particular the number of mental breakdowns in young people has greatly

increased in this century. This trend in psychiatry has modified all considerations regarding prognosis.

Another point in the general question is that there has been a correspondingly great increase in congenital mental defect over the same period, and here again the degree of defect has often been slight. Rather a feature in this aspect of the case has been examples of neurologically determined defects such as congenital agraphia or alexia, in which the workshops of the mind seem to have suffered rather than the psyche. Such cases are now less of a rarity than formerly. They often seem pretty normal till education is attempted, when it is found that writing or reading or perhaps arithmetic cannot be normally comprehended. The education and prospects of such children is a sad problem.

Yet another factor to be considered is that this phase has coincided with the establishment of the endemicity of the septic focus. A school has arisen which believes that in the septic focus we have the prime cause of a considerable or even a large proportion of mental breakdowns. In these days we can almost always find something that will answer for a septic focus. But here again the septic focus was for practical purposes unknown until this century. In proof of this we need only consider the loss of teeth that is resulting from periodontal sepsis. In my own student days in the beginning of the century it was quite exceptional for any one to lose so many teeth as to need a denture. Then in a sudden wave an international shedding of teeth occurred and countless millions of teeth were lost. There is no doubt that a focus of toxic absorption may precipitate a mental breakdown, or aggravate one, but there seems great doubt that the septic focus deserves the fundamental place in the aetiology of the mental breakdown that some would allow it. On the whole, applications of this idea have not borne out the hopes that were entertained of it, the truth of the matter being that the mental and the septic focus are fundamentally related to a common cause rather than to each other.

One cannot know whether the average level of the health of the world fluctuates appreciably over long periods, but there seems to have been a sudden low tide in it in the early years of the twentieth century, which suddenly reduced us to a C3 world. We in this country are about to take this in hand and attempt to improve the health of the rising generation. This phase has been marked by a general lowering of health and poor resistance to infection. The result has been very suggestive of a gigantic "release phenomenon," to borrow a term from neurology. Immunizing control has become weakened with the result that pathological processes due to infection have been free to evolve into mystery illnesses in men and animals, to violate age limits, to achieve intractable endemicities and to blur the outlines of clinical medicine in ways which contrast with the orderly establishment of infective illness within some of our memories. One of the earliest recorded manifestations of this new phase creating an administrative problem was the intractable endemicity of tonsillitis in

certain barracks and other military institutions in this and other countries some thirty years ago. The new endemicity of foot and mouth disease in cattle began at the same time and has proved a great economic problem ever since. The world endemicity of rheumatism which is the result of defect in the resistance to infection began at the same time and is of the same ætiology, as indeed is the prevalent periodontal infection already mentioned.

A new disease which seems to be obtaining a similar hold is of interest in connexion with the neuroses ; this is the mystery hysteria of certain animals, notably of dogs, and which is a problem for those concerned. In mild examples of the illness the dog exhibits symptoms of sudden causeless panic and runs headlong in terror, dashing itself into anything in its way, or attacking those who approach. Recovery may follow without apparent ill-effects, but in the severer cases the illness leaves reduction of intelligence and a kind of canine dementia. I believe that the pathology is obscure, but the illness is thought to be due to some virus infection. I have no wish to suggest that anxiety conditions in the human subject may be due to some infective condition of the brain, but it is an interesting fact that many psychotic symptoms can be produced by drugs, for example those of schizophrenia, catatonia, paranoia, melancholia, etc., and there is a school which believes that mental disorder is the result of toxic effects on the brain.

I think it is very probable that the resistance of the brain tissues has suffered during this phase. Should any difficulty with the insulation of the emotions result then the stage is set for the appearance of anxiety conditions which will be precipitated by circumstances which should normally be successfully dealt with.

As regards extraneous situational factors in the ætiology I am inclined to think that worry over ill-health almost deserves a place alongside the other worries quoted.

These views can be summed up in saying that so much of the resistive resources of the body is constantly on call to combat the present low tide in world health that some general exhaustion results which is very liable to be among other things reflected in defective mental resistance.

If there is any truth in these suggestions this seems more likely to be appreciated by those whose memory of the study of medicine goes back thirty years or more than by those whose memories cover only the period of the present phase, which is obscured by an element of relativity in that the ill-health that is being commented on in different countries is really universal, and so unable to be estimated by contrast with some contemporary healthier standard. The long memory could I think read the signs of this low tide in the resistance to the infective process in many departments of medicine, and, actually it has come to be appreciated that there is something amiss with the health of the nation ; it does not seem to be fully appreciated, however, that this failure of health is worldwide.

I believe that the present failure is terminating, that the end of the century may see a return to a normal level of world health. It seems impossible to form any opinion as to whether any such dramatic ebb in the general level of health has ever occurred before, or whether anything similar is likely to happen again and at what intervals. It seems the irony of fate that this phase should have coincided with a falling death-rate over the same period in civilized countries, and the actual halving of it in some. It is, however, only the latterday advances in medicine and surgery that have prevented a considerable increase in the death-rate.

A REPORT ON THE TYPES, CAUSES, LOCATIONS AND TREATMENT OF SEVENTY-SIX RECENT CASES OF FRACTURES OF THE JAWS.

BY MAJOR S. H. WOODS, O.B.E.

The Army Dental Corps.

INTRODUCTION.

IN war time, the vast majority of fractures of the jaws are due to gunshot wounds involving the face, causing loss of hard and soft tissues with much displacement of their fragments. The treatment of these injuries is necessarily complicated and lengthy, requiring the co-operation of dental-surgeon, surgeon, and plastic specialist, and has been fully considered in the first Report (October, 1934) of the Army Advisory Standing Committee on Maxillo-Facial Injuries, on which I had the privilege of serving.

The section of that Report dealing with the general principles of the treatment in the field was republished in this *Journal* in July, 1936, and was of great interest to medical officers.

In peace time, however, fractures of the jaws are of a totally different character. Loss of tissue is rare and, with few exceptions, the cases are dealt with entirely by the dental officer. As nothing concerning these injuries in peace time has appeared in this *Journal* since the formation of The Army Dental Corps in 1921, it would seem desirable now to draw attention to them.

In the past eight years, I have treated seventy-six cases, from Commands at Home and Abroad, in the Dental Department, Queen Alexandra Military Hospital, Millbank, London. They are sufficiently numerous and varied to permit of a report on their types, causes, locations and treatment, which may be of some interest.

ANNUAL INCIDENCE OF CASES					
Year			Officers	Other ranks	Total
June to Dec., 1929	..	..	2	5	7
1930	..	..	2	14	16
1931	..	..	1	10	11
1932	..	..	1	6	7
1933	..	..	3	6	9
1934	..	..	3	8	11
1935	..	..	Nil	5	5
1936	..	..	3	2	5
Jan. to March, 1937	..	..	2	3	5
<hr/>					
Totals—8	..	..	17	59	76
<hr/>					
Yearly average	..	..	2	7	9

Explanation of abbreviations and symbols used in the analyses.

The thirty-two teeth are indicated by the following notation :—

(Upper right) 8 7 6 5 4 3 2 1 | 1 2 3 4 5 6 7 8 (Upper left)

(Lower right) 8 7 6 5 4 3 2 1 | 1 2 3 4 5 6 7 8 (Lower left)

1, 2 indicate incisors

4, 5 indicate premolars.

3 indicates canine

6, 7, 8 indicate 1st, 2nd and 3rd molars respectively.

Thus, $\overline{8}$ signifies lower left third molar,

x.	indicates	extraction	fract.	indicates	fracture
u.	„	unerupted	comn.	„	comminution
p. e.	„	partially erupted	maxl.	„	maxillary
f. e.	„	fully erupted	w. lig.	„	wire ligature
und.	„	under	ret.	„	retained
bet.	„	between	bite	„	the articulation
mult.	„	multiple			of the teeth
mts.	„	months			

SUMMARY OF 76 CASES, IN ORDER OF OCCURRENCE, SHOWING RANK, AGE
CAUSE, LOCATION AND TREATMENT.

Case No.	Rank	Age	Cause	Location	Treatment
1	Cpl.	20	Knocked down by motor car	(a) und. $\overline{8}$ u. (b) bet. $\overline{82}$	(a) $\overline{8}$ x. (b) ret. $\overline{82}$ | w. lig.
2	Gdm.	19	Boxing	und. $\overline{8}$ u.	$\overline{8}$ x.
3	Tpr.	19	Fist	und. $\overline{8}$ u.	$\overline{8}$ x.
4	Pte.	20	Fist	und. $\overline{8}$ p. e.	$\overline{8}$ x.
5	Pte.	22	Boxing	und. $\overline{8}$ f. e.	$\overline{8}$ ret.
6	Lt.	20	Fell off horse	(a) und. $\overline{8}$ u. (b) bet. $\overline{43}$	(a) $\overline{8}$ x. (b) $\overline{43}$ | ret.
7	Lt.	22	Fell 25 ft. off window ledge	(a) base of skull (b) mult. both jaws	First seen 3 mts. after; x. injured teeth; splints
8	Gnr.	26	Horse kick	(a) L. and R. condyles (b) bet. $\overline{43}$	First seen 5 mts. after; splint to improve bite
9	Pte.	24	Fist	(a) L. condyle (b) bet. $\overline{21}$	First seen 6 mts. after; non-union at (b) x. $\overline{21}$ | $\overline{12}$ and sequestrum; splint
10	Capt.	27	Motor car accident	(a) base of skull (b) mult. both jaws	First seen 4 mts. after; splints
11	Ret.	19	Boxing	R. condyle	Grind bite
12	Sapp.	22	Fist	und. $\overline{8}$ | f. e.	$\overline{8}$ | $\overline{8}$ x.
13	Tpr.	24	Fell down steps	(a) L. angle (b) bet. $\overline{21}$	$\overline{21}$ | x.; intermaxillary wiring
14	Pte.	21	Fell on chin	und. $\overline{8}$ | p. e.	$\overline{8}$ | x.
15	Gdm.	22	Fist	(a) und. $\overline{8}$ f. e. (b) und. $\overline{5}$	$\overline{5}$, $\overline{8}$ x.
16	Pte.	23	Fist	(a) L. condyle (b) bet. $\overline{1}$ $\overline{1}$	(a) grind bite. (b) ret. $\overline{1}$ $\overline{1}$; splint

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SUMMARY OF 76 CASES—Continued.

Case No.	Rank	Age	Cause	Location	Treatment
17	Gnr.	26	Fist	(a) behind 7 (b) und. 34	First seen 3 mts. after; non-union at (b) 34 x.; splint
18	Tpr.	25	Fist	und. 8 | f. e.	8 | x.
19	Pte.	24	Boot kick (brawl)	(a) bet. | 68 (b) und. 4 |	(a) | 68 x.; (b) 4 | ret. w. lig.
20	Cpl.	27	Fist	und. | 8 f. e.	| 8 x.; much sepsis; external drainage
21	Cpl.	26	Fell on face (football)	R. condyle	Grind bite
22	Tpr.	26	Motor car accident	bet. | 45	| 45 x.; intermaxillary wiring
23	Capt.	25	Boot kick (football)	bet. 87 |	87 | x.
24	Tpr.	27	Fist	(a) R. condyle (b) bet. | 45	(a) grind bite. (b) | 45 x.
25	Pte.	20	Fist	und. | 8 u.	| 8 ret.
26	Pte.	24	Boxing	und. | 8 f. e.	| 8 x.
27	Cpl.	24	Fist	(a) und. | 8 f. e. (b) und. 5 |	5 | 8 x.
28	Gdm.	26	Fist	L. condyle	Grind bite
29	Gnr.	26	Heavy fall on face	(a) base of skull (b) und. | 8 f. e. (c) und. 32 |	(a) rest. (b) and (c) 32 | 8 x. Surgical wiring at (b)
30	Gdm.	24	Fell on R. cheek	Through socket of 8 x. 3 weeks previously	Rest; grind bite
31	Gdm.	23	Boot kick (football)	L. malar	Rest
32	Gnr.	27	Horse kick	(a) und. | 7 (b) bet. | 45 (c) upper and lower incisors fract.	(a) and (b) 7 | 45 x. (c) incisors x. Mandibular support by head net
33	Sjt.	31	Fell down steps	(a) L. malar (b) outer wall L. antrum (c) | 345 fract.	| 345 x.; rest; antrum not disturbed
34	F/Lt. R.A.F.	31	Struck by propeller	(a) base of skull (b) nose (c) mult. both jaws	Complicated splints
35	Capt.	22	Fell off motor cycle	Comn. upper incisor region	x. incisors; irrigation

SUMMARY OF 76 CASES—Continued.

Case No.	Rank	Age	Cause	Location	Treatment
36	Cpl.	28	Hit by beer bottle	(a) L. malar (b) outer wall L. antrum (c) several teeth	x. injured teeth; rest; antrum not disturbed
37	Dvr.	20	Tripped up by puttee coming undone	und. | 8 u.	| 7 x.; grind bite: | 8 ret.
38	Gnr.	23	Horse kick	(a) L. condyle (b) bet. 54 | (c) bet. | 67	54 | 67 x.; intermaxillary splints
39	Bdr.	26	Boot kick (football)	L. condyle	Grind bite
40	Gdm.	23	Horse kick	(a) R. condyle (b) bet. | 23	(a) grind bite. (b) ret. | 23 w. lig.
41	Gdm.	21	Fist	und. | 8 p. e.	| 8 x.
42	Lt.-Col.	52	Horse kick	mult. both jaws	Complicated appliances
43	Maj.	44	Fell from horse	(a) L. condyle (b) incisor region	Splint
44	Gnr.	25	Boot kick (brawl)	(a) und. | 8 f. e. (b) bet. 32 |	| 8 x.; ret. 32 | w. lig.
45	Dvr.	20	Horse's knee	L. condyle	Grind bite
46	Gdm.	21	Fell on face	und. | 8 p. e.	| 8 x.
47	Pte.	24	Fist	L. condyle	Grind bite
48	Pte.	20	Boxing	und. | 8 p. e.	| 8 x.
49	Pte.	24	Fist	bet. | 34	| 34 x.
50	Lt.	22	Boxing	L. condyle	Grind bite
51	Capt.	33	Gunshot wound, N.W. Frontier, India	(a) mult. lower jaw (b) upper incisor region	First seen 3 mts. after; complicated splint
52	Cpl.	30	Horse kick	(a) bet. | 78 (b) und. 32 |	First seen 13 mts. after; non-union at (a). Surgical wiring at (a)
53	Lt.	22	Cricket ball	und. 76 |, but not involving them	76 | ret.
54	Lt.	24	Hockey stick	bet. | 45	| 45 x.
55	Gdm.	22	Fainted on parade, falling heavily on chin	(a) L. and R. condyles (b) several teeth (c) severe concussion	x. injured teeth; grind bite; graduated masticatory exercises
56	Gdm.	23	Fainted on parade—as Case 55		

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SUMMARY OF 76 CASES—Continued.

Case No.	Rank	Age	Cause	Location	Treatment
57	Pte.	23	Horse's head	through $\overline{6}$ socket ($\overline{6}$ x, 6 weeks previously)	Rest ; grind bite
58	Sjt.	26	Fell on face	(a) und. $\overline{6}$ | (b) behind | $\overline{8}$ f. e.	(a) $\overline{6}$ | x. (b) ret. | $\overline{8}$
59	Gdm.	24	Fist	(a) und. | $\overline{8}$ f. e. (b) bet. $\overline{54}$ |	(a) | $\overline{8}$ x. (b) $\overline{54}$ | ret. ; intermaxillary wiring
60	Pte.	21	Boxing	und. | $\overline{8}$ p. e.	| $\overline{8}$ x.
61	Pte.	20	Boxing	und. | $\overline{8}$ u.	| $\overline{8}$ ret.
62	Dvr.	26	Horse kick (glancing)	und. but not involving $\overline{76}$ |	Rest
63	Dvr.	25	Horse kick (under nose)	comn. upper incisors	x. incisors ; irrigation
64	Gdm.	24	Faint on parade — as Case 55		
65	Sjt.	30	Fell on face	L. malar	Rest
66	Rct.	22	Faint on parade — as Case 55		
67	Sjt.	27	Cricket ball	L. vert. ramus	rest ; grind bite
68	Tpr.	20	Faint on parade — as Case 55		
69	Col.	56	In motor accident	(a) base of skull (b) mult. both jaws	First seen 4 mts. after ; complicated splints
70	G/Cdt.	19	Horse kick	(a) bet. | $\overline{45}$ (b) much comn.	$\overline{45}$ x. ; splint ; infection ; remove splint ; external drainage ; finger support
71	Lt.	21	In motor car accident	mult. both jaws	First seen 4 mts. after ; splints
72	Capt.	27	Knocked down by motor car	(a) base of skull (b) maxl. sutures (c) bet. $\overline{21}$ | (d) $\overline{21}$ | $\overline{12}$ splintered $\overline{21}$ | $\overline{12}$	(a) and (b) rest ; incisors x. ; irrigation
73	Gdm.	21	Fist	und. | $\overline{8}$ u	| $\overline{8}$ ret.
74	Capt.	30	Motor car accident	comn. ; all incisors	x. incisors ; irrigation
75	Rct.	22	Fainted on parade	(a) R. condyle (b) bet. | $\overline{12}$	(a) grind bite. (b) | $\overline{12}$ ret.
76	Rct.	20	Boxing	und. | $\overline{8}$ p. e.	| $\overline{8}$ ret.

DIFFERENTIATION ACCORDING TO BONE INVOLVED.

Fractures of	No.	Per cent
Mandible only	63	83
Maxilla "	6	8
Both jaws "	7	9
	76	100

As the mandible is more exposed to violence than the maxilla, the former is much more often fractured, the ratio in the above analysis being 10 to 1.

Mandibular fractures totalled four-fifths of all cases.

DIFFERENTIATION ACCORDING TO TYPE OF FRACTURE.

	No.	Per cent.
Single fracture of mandible only	34	44.7
" " " maxilla "	3	4.0
Double fractures of mandible only	25	33.0
" " " maxilla "	2	2.6
Multiple " " mandible "	4	5.2
" " " maxilla "	1	1.3
" " " both jaws "	7	9.2
	76	100

The most frequent type of injury was a single fracture of the mandible—45 per cent—followed by double fractures of the same bone—33 per cent.

DIFFERENTIATION OF LOCATIONS IN THE MANDIBLE—THIRTY-FOUR SINGLE FRACTURES.

Location	No.	Per cent.
Under left 3rd molar	15	44
" right " "	4	12
Left condyle	5	14
Right " "	3	9
Left canine and premolar region	3	9
Right " " " "	1	3
Right molar region	2	6
Left vertical ramus	1	3
	34	100

Note the significance of the 3rd molar tooth. 19 cases, or 56 per cent., were located under it, a proof of the weakness of the bone at this site. The left side was four times as frequent as the right.

DIFFERENTIATION OF LOCATIONS IN TWENTY-FIVE DOUBLE FRACTURES OF THE MANDIBLE.

Primary fracture	Secondary fracture	No.	Per cent
Under left 3rd molar	Right canine and premolar region	7	28
Both condyles	" " " "	5	20
Left condyle	Right incisor region	4	16
1st or 2nd molar region	Opposite canine and premolar region	4	16
Right condyle	Left " " " "	3	12
Left angle	Right incisor region	1	4
Right 1st molar	Left 3rd molar "	1	4
		25	100

Owing to the shape of the mandible, a secondary fracture frequently occurs on the side opposite the main injury, usually at the site of maximum curvature, which is the canine and premolar region. Fourteen cases, or 56 per cent, occurred in this region.

Other Locations.

In the maxilla, the single fractures were in the left molar bone.

Multiple fractures of one or both jaws were due to extreme violence, causing breaks in any place, and an analysis is not possible.

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ANALYSIS OF CAUSES.						No.	Per cent.
Cause							
Bare fist	18	23·7
Falls (various, but excluding those due to fainting on parade)						14	18·4
Boxing ..	..	..	..	..	..	9	11·8
Horse kicks ..	..	..	..	..	..	9	11·8
Fainting on parade, falling heavily on chin ..	..	..	..	..	..	6	8·0
Boot kicks ..	..	..	..	..	..	5	6·6
Motor car accident ..	..	..	..	..	..	5	6·6
Miscellaneous :—							
Knocked down by motor car ..	..	..	..	..	..	2	10 13·1
Cricket ball ..	..	..	..	..	..	2	
Gunshot wound ..	..	..	..	..	..	1	
Hockey stick ..	..	..	..	..	..	1	
Horse's head rearing up ..	..	..	..	..	..	1	
Propeller blade ..	..	..	..	..	..	1	
Beer bottle ..	..	..	..	..	..	1	
Horse's knee ..	..	..	..	..	..	1	
						76	100

As would be expected, a blow with the *bare fist*—still the readiest weapon in an argument—is the most frequent cause—(24 per cent).

Falls on the face (the man being conscious) come next, followed by blows when *boxing*. Note that the bare fist and boxing, taken together, are responsible for 35 per cent of all cases, a proof that the fist is mightier than the jaw.

Horse kicks are not infrequent (11·8 per cent) and it will be interesting to note what effect mechanization may have on their incidence.

Faints on parade are an interesting and unusual group, the six cases being almost identical. The soldier on parade begins to feel faint, but, instead of falling out, training and discipline cause him to “stick it” to the limit of endurance. He loses consciousness and falls stiffly “at attention,” his chin striking the ground with great force—a sort of H. M. Bateman “Guardsman who Dropped.”

Case 75 (now under treatment) is a recruit of 6 feet 5 inches—no wonder he complains of severe headache!

Boot kicks were either in football or in brawls, and, in these days of speed, passengers in *motor-car accidents* are likely to receive severe injuries of the jaws.

CORRELATION OF EACH CAUSE WITH TYPES AND LOCATIONS.

A.—Bare Fist.

		No.	
	Cases in lower jaw ..	18	
	„ upper „ ..	0	
<i>Types—</i>	Single fractures ..	12	
	Double „ ..	6	
<i>Locations in Single Fractures—</i>	Under | 8	6	
	„ 8 |	3	
	Left condyle ..	2	
	Between | 34 ..	1	
<i>Locations in Double Fractures—</i>	Primary	Secondary	No.
	| 8	54 | region	3
	Left condyle	21 | „	2
	Right „	| 45 „	1

As the vast majority of men are right handed, the right first delivers the "K.O.," the blow being received on the left side of the jaw. Consequently fracture on the left side is much more frequent than on the right side, the ratio in single fractures being 3 to 1, and, in double fractures, 5 to 1.

Note the Significance of the 3rd Molar. From the age of 18, when the soldier joins, to about 23, this tooth is in process of eruption and fracture immediately under it is to be expected during these ages, for the weakness of the bone in this region has already been noted. Of the nine single fractures under this tooth, three involved unerupted teeth.

In the nine cases of single fracture under this tooth, the degree of development of the tooth was as follows :—

		No.
<i>Left 3rd molar</i> —	Unerupted	3
	Partially erupted	2
	Fully erupted	1
<i>Right 3rd molar</i> —	Unerupted	0
	Partially erupted	1
	Fully erupted	2

B.—Falls. Fourteen Cases.

In this group, the man falls heavily on the left or right cheek, or the chin. The injury is generally severe, resulting in much displacement and laceration or bruising of lips or cheeks.

	No.
Cases in lower jaw	10
„ upper „	3
„ both jaws	1
<i>Types</i> —Single fractures	7
Double „	6
Multiple „	1

Locations in Single Fractures—

Lower Jaw.

Under 3rd molar	4
Right condyle	1

<i>Upper Jaw.</i> Left molar	2
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The locations of the double fractures were too varied for analysis.

C.—Boxing. Nine Cases.

As in (A), the left side is again injured more frequently, and the third molar region is the common location.

	No.
Cases of lower jaw	9
„ „ upper „	0
<i>Types</i> —Single fractures	9
Double „	0
<i>Locations</i> —Left 3rd molar	7
Left condyle	1
Right condyle	1

It must be noted that all were single fractures of mandible only, the glove distributing the force over a large area, causing a break in the region

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of maximum strain; which is at the 3rd molar or condyle. Also, the molar fractures were on the left side only.

COMBINATION OF BARE FIST AND BOXING.

No. of cases	Single fractures	Double fractures	3rd molar locations
27	21	6	17

D.—Horse Kicks. Nine Cases.

Unless it is a glancing blow, a horse kick causes extensive injuries to hard and soft tissues, usually involving several teeth, and the bone may be comminuted.

	No.
Cases of lower jaw	7
„ „ upper jaw	2
<i>Types</i> —Single fracture of lower jaw	3
Double „ „	4
Multiple „ „ both jaws	2

The locations were too varied for analysis.

E.—Fainting on Parade. Six Cases.

The man falls heavily on the chin, the strain being taken by the condyles, which are fractured. In addition, the mandible is driven with much force against the maxilla and several teeth in each jaw are injured. There is always a severe concussion, and the chin or lips are cut or lacerated.

	No.
Cases of lower jaw	6
„ „ upper „	0
<i>Types</i> —Single fractures	0
Double	6
<i>Locations</i> —Both condyles	5
Right condyle and left incisor region	1

F.—Boot Kicks. Five Cases.

	No.
Cases of lower jaw	4
„ „ upper „	1
<i>Types</i> —Single fractures	3
Double „	2
<i>Locations varied.</i>	

G.—Motor Car Accidents. Five Cases.

In only one case did the passenger escape lightly—Case 22, with a single fracture and slight concussion.

In the other four, there was either a fractured base of skull or severe concussion, with multiple injuries of both jaws and nasal bones, and several teeth.

The extreme force usually causes a comminution of the anterior part of the maxilla and a loosening of all, or many, of its sutures; the bone as a whole being movable.

The mandible may be fractured anywhere, but in most of these accidents the upper jaw took the main blow and suffered the greater injury.

TREATMENT.

In general, treatment consisted in :—

(a) Overcoming sepsis by careful oral hygiene and frequent irrigation, particularly in the lines of fracture.

(b) Extracting unsalvageable injured teeth.

(c) Extracting teeth directly in the line of, or adjacent to, a fracture only when clearly indicated, and *not* as a routine. There is much controversy as to the extraction or retention of teeth in these situations. While many authorities advocate extraction in every case, experience tends to show that, in peace-time fractures at any rate, retention in many cases was possible without endangering or retarding union. Perhaps I have been luckier than I deserve, especially in connexion with third molars, and success in these cases may have been due to the particular attention given to the control of sepsis. Retention was successful in six cases of fracture under the third molar. Again, teeth on either side of secondary fractures were retained in nine cases.

(d) Reducing the local swelling and pain by a temporary or partial control of fragments by simple means, such as ligature of teeth on either side of a fracture, or mandibular support attached to a headnet.

(e) Reducing the displacement as soon as sepsis and swelling permit. In a few cases it was possible to obtain perfect position of fragments at once, but in the great majority a certain time elapsed before the local bruising and hæmatoma subsided, so as to permit pressure in the desired directions and situations.

(f) Controlling the fragments in correct position by : (i) immobilizing them in a fixed appliance or by other means, or (ii) supporting them loosely, thus permitting a certain degree of movement of the fragments.

(i) *Immobilization.*

The various appliances and other means of retaining fragments in a fixed position in the different types and locations of fractures were similar to those outlined in that section of the Advisory Maxillo-Facial Committee's Report dealing with the treatment in a special hospital or department for such injuries.

Each case was a problem in itself, and success depended on correct design and construction of the appliance.

Inter-maxillary ligature with wire was very useful in three cases, permitting immediate reduction as well as fixation.

(ii) *Loose Support, Permitting Movement—"Finger Support."*

This method is unorthodox, being contrary to the general teaching, but I have practised it with success for many years and used it in the majority of the cases where a fixed appliance was not employed. For want of a better name it may be called "finger support."

When the initial sepsis and swelling have subsided, it is frequently possible by firm finger pressure under the mandible to approximate the fragments and guide the teeth into correct, or nearly correct, occlusion with the upper teeth. The patient is then instructed, with the aid of a mirror, how to bring this about himself and how to maintain this position for reasonable intervals without strain.

Persistence and practice are necessary, but as the improvement is visible to the patient he becomes enthusiastic, and in a few days (with a judicious grinding of a prominent cusp here and there) he can maintain his teeth in perfect occlusion with ease for long periods. At the same time, the diet is graduated so as to require some mastication. In about another week or ten days finger support is no longer required, for the mobility of the fragments causes a very rapid production of callus which is sufficient to maintain them in position, aided by the muscles of mastication, which also tend to control them.

The diet is gradually hardened to normal and union is very rapid, much more so than with fixed appliances.

I have had two, or even three, almost identical cases racing with each other as to which could first maintain position without finger support.

This simple method has everything to commend it, and in the less severe cases is the one I adopt whenever possible.

DIFFERENTIATION ACCORDING TO DEGREE OF DISPLACEMENT.

Treatment varied according to the degree of displacement and difficulty of control, which was either (a) severe, (b) moderate, or (c) slight or none.

				No.
Severe	..	..	..	11
Moderate	..	..	..	15
Slight or none	..	..	..	50
				<hr/> 76

A.—Severe. Eleven Cases.

In these, the injury caused either multiple fractures in one or both jaws, or much displacement in locations difficult of control.

Fixed appliances were required in nine cases; surgical wiring was performed in two cases.

The treatment of some of these was rendered unduly difficult and prolonged on account of delay in calling in a dental officer, the surgeon treating the patient thinking that he was too ill for dental interference or that nothing could be done, anyhow, till things "settled down." Indeed, the condition of two cases from abroad, who had not been seen by a dental officer at all, was lamentable on arrival, and inexcusable in these days when dental officers are available at the larger hospitals. Perhaps an echo of my report on these cases at the time may have reached overseas to prevent such a recurrence.

It is of utmost importance that dental treatment should begin at the earliest moment a dental officer is available, for it is possible for him by simple means to reduce the risk of the spread of sepsis, to make the patient much more comfortable than he generally is with the useless four-tail bandage usually applied to retain teeth and bony fragments which would otherwise be lost and so complicate future treatment, and to initiate control of displacement.

It is the rule at Millbank that the Dental Department is informed as soon as it is known that a case of jaw injury is expected or admitted.

Surgical wiring was successfully performed in conjunction with the surgical specialist in two cases of extreme difficulty.

Case 29: Interdental splints had been made, but, before they could be applied, the patient developed a severe influenzal bronchitis. When he had recovered, the displacement of the posterior fragment had increased markedly, and a successful and uneventful surgical wiring of the bones was performed, supported by the splints previously made.

Case 52: There was non-union in the molar region owing to the interposition of a thick band of the masseter muscle between the fragments. This was excised, the bone ends freshened and wired together, supported by intermaxillary splints.

B.—Moderate Displacement. Fifteen Cases.

	No.
Number requiring fixed appliance	5
" " inter-maxillary wiring	3
" " "finger support"	7
	<hr/> 15

These were mainly double fractures, with moderate displacement at the primary location and slight or none at the secondary location.

C.—Slight or no Displacement. Fifty Cases.

These include the majority of the single fractures, mainly under the third molar or through the neck of the condyle. The apparent disturbance of the articulation in many of these cases caused them to be marked "much displacement" by the medical officer admitting them, and it is a pardonable error, for what appears to be a derangement in articulation of the teeth is nothing more than a gagging of the upper molars on the swollen tissues of the lower jaw. As soon as the swelling subsides with appropriate treatment or extraction, the bite becomes normal and the patient is put on minced diet for a short time, then on normal diet and dismissed after a surprisingly brief stay in hospital. "Finger Support" was the method of choice in these cases.

While the greater number were "compound" in the sense that there was a tear in the mucous membrane or gum, exposing the bone to some extent, the tear was usually limited and tended to close quickly under appropriate treatment.

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It must be noted that there was no case of fracture of the edentulous jaw, which is somewhat surprising, as recruits wearing complete dentures have been accepted since 1926, and many men are supplied with them during their service. Also, there was no case among the children of soldiers—their injuries being confined to the teeth and gums.

The true extent and locations of fractures are revealed only by X-ray examination, and I would like to take this opportunity of thanking Lieut.-Colonel E. V. Whitby, D.M.R.E., and Major H. E. P. Yorke, M.C., D.M.R.E., who were in charge of the X-ray Department during the last eight years, for their ever-ready and most valuable co-operation.

Lastly, I have to thank Colonel R. W. D. Leslie, O.B.E., Officer Commanding Queen Alexandra Military Hospital, Millbank, for kind permission to submit this report for publication.

HEAT EXHAUSTION AND DEHYDRATION IN THE ARABIAN DESERT.¹

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THE forced landing of the aeroplane "Horsa" in the Arabian Desert at 4 a.m. on Saturday, August 29, 1936, presented an occasion—unwelcome though it was—to observe the effects of the heat exhaustion followed by great body desiccation after a few hours' exposure to dry desert heat. A few notes may be of some general professional interest.

ON THE ATMOSPHERIC CONDITIONS.

One officer was interested in this point and watched the available thermometers. In the shade of the wings where the passengers lay he estimated that the air temperature was about 125° or 130° F. from soon after sunrise to sunset. This, of course, was a temperature much above that of the human body. The air humidity was extremely low, since the air was scorched-dry in its passage over the burning desert sands, which surrounded the airship on all sides and continued without water, trees, shade or vegetation for some fifty miles.

Air Movement.—A continuous fair breeze—though hot and dry—made conditions seem less unpleasant.

ON THE RESULTING HEAT EXHAUSTION.

The first experience of great body heat stimulated endeavours to anticipate and to minimize the condition which was likely to follow; the symptoms were slight restlessness, considerable giddiness and faintness, inability to walk beyond a few steps or even to stand, and rapid shallow breathing. Such symptoms were followed by signs of severe cardiac collapse, evidenced by a cold skin, a feeble pulse and cyanosis. The clammy sweat one would have expected with cardiac collapse was not apparent since it at once evaporated and increased the skin coldness. The available brandy, spiritus ætheris nitrosi, digitalis, and eau de Cologne, for such cases proved invaluable. The early appearance of such cardiac collapse symptoms amongst a group of fit officers returning from leave was remarkable. The ship's captain and navigation officer were the first two cases. They developed symptoms about noon after some six hours' exposure which included the early morning hours when the heat was less trying.

¹ Reprinted, by permission, from *The Indian Medical Gazette*, vol. lxxi, No. 12, December, 1936.

ON THE INFLUENCE OF MENTAL STRAIN.

In them, however, the considerable mental strain, to which they had been exposed for two hours before landing, provided a special predisposing factor. During this period the Bahrein aerodrome could not be located on account of defective lighting and the enveloping haze, whilst wrong air bearings directed the aeroplane further into the desert instead of into its airport. Petrol was almost exhausted but a forced landing in unknown country before the first light of the breaking dawn was full of the gravest danger. In such circumstances the responsibility for passengers, mail, and plane was no light one.

ON THE INFLUENCE OF PHYSICAL EXERTION.

The least movement added to the body heat which the vital processes themselves produced. We soon found that exertion of any degree was followed by increasing weakness and that a few yards of staggering walk was of necessity followed by a period of breathless immobility. All, therefore, soon diminished physical exertion to an absolute minimum. And yet it was remarkable how eleven out of the thirteen managed to cross one mile of desert at 2 in the afternoon to the rescuing R.A.F. bomber—though it was true that this was accomplished after copious fluid and concentrated foods.

It appeared indeed doubtful whether all could cross that mile but the attainment of safety at the end was the prize that won through. Some marched with eyes fixed on the ground a few yards ahead. To look at the plane itself seemed a distance impossible of attainment. I personally made for a selected mark about twenty yards ahead and, encouraged by the successful accomplishment of that, chose such successive landmarks till the plane was reached. Perhaps I was lucky in being the possessor of an umbrella, which was especially fortunate, as two of us had no topees. Some of us at bad periods were helped by gallant men of the Royal Air Force. Three-quarters of an hour was spent on that mile in absolute silence, every energy being concentrated on the goal to be attained.

RESULTING BODY DEHYDRATION.

The dry scorching breeze like a blast from a furnace sucked fluid through the skin sweat glands which immediately evaporated so that no visible sweat was produced. This evaporation, no doubt, caused some slight cooling of the skin surface, which made us choose to lie where the breeze was. But such temporary cooling was produced only at the vital expense of the invisible constant drain of body fluids through the skin to the atmosphere. I recall considering whether it would be of greater advantage to lie where there was no breeze and conserve one's body fluids, or to hazard the future for the slight relief the breeze gave. And the present won! The available fluids, in the ration of three-quarters of a small tea-cup thrice daily, were a drop in the ocean in an attempt to replace any material part of the fluid lost through the skin. The clinical

result was not unlike that of a cholera attack though the fluid was not lost through the same channel. The skin became "bone" dry and lost elasticity. The eyes sank into their sockets and became encased with heavy dark rims. The cheeks hollowed, the pulse became feeble—and its tension fell due to diminished volume from dehydration. The urinary secretion failed, so that a few ounces only were voided in the twenty-four hours and that of the deepest colour, most concentrated and highly acid—so that its passage was accompanied with a slight sting. Blood changes, resulting from the rapid loss of blood fluid, must have corresponded to those in cholera. The total red and white cells must have relatively risen—and blood become thick and "tarry." Cyanosis certainly developed. The highly acid urine pointed to a reduced blood alkalinity, as in cholera. The blood urea must have considerably risen. The urea retention was not due to failure of the excretory kidney function from organic disease, as in the uræmia of advanced Bright's disease, but to retention due to desiccation of the body—by an acute drain of the body fluids from it—with insufficient fluids by the mouth to provide for a urinary secretion—as in cholera and at times in diabetic coma. It will be recalled that an easy method of bedside differentiation of these two types of retention is by estimating the concentration of urinary urea, which is high in dehydration when the kidney is healthy and could concentrate well, and low in Bright's uræmia when the kidney is almost entirely destroyed. No doubt toxic metabolic products and acids retained by the failure of the urinary excitation were in great part responsible for the muscular weakness producing physical inactivity, for the mental drowsiness which all felt, for the dyspnoea from which many suffered, and for minor bouts of Cheyne-Stokes' respiration which also occurred.

ON MENTAL REACTIONS.

During the first few hours the faculties of perception and understanding were stimulated. The situation seemed appreciated in its correct perspective with the utmost clarity and right decisions seemed easily and rapidly reached. Later such periods of clarity were recalled whenever decision of thought was required, but periods of drowsy sleepiness started to intervene. Amongst the problems to be decided were: the immediate necessity of rationing our slender drink and food resources, of working the plane's ground wireless, of not leaving the plane in any attempt to reach the sea or to search for help, of conserving our strength, of diminishing heat production by body inactivity, of the best time to fire the available twelve Very lights and two magnesium flares which were carried, of other means of possibly attracting attention, of the best manner of aiding our comrades when attacks of exhaustion seized them, of the best employment of the available sedative, sleeping, stimulant and other drugs, of the collection of night dew from the aeroplane wing and of its possible poisoning qualities

from aeroplane wing dope if drunk, of sanitary arrangements, and of the manner of dealing with possibly unfriendly Arabs if such appeared.

My present estimate was 5 per cent of chances we should be found on the first day, 95 per cent on the second, and 100 per cent on the third day, but I also estimated (though did not mention) that probably two or three would be dead by the second evening and only two or three would survive by the third evening. Deaths would, I think, have been easy by increasing drowsiness, breathlessness, and cardiac failure.

A few delusions of mild degree arose, e.g. that it was raining beyond the plane, and the individual (who was too weak to move) was being restrained from reaching the cooling water. Some dozed and dreamt. One dream was of turtles waddling in their dozens from a river, fattened by feeding on corpses, and advancing over the desert hungry for their latest victims. Their huge red eyes gleaming in anticipation formed a target for the thrust of the point of the dreamer's umbrella—when thus blinded they attacked each other. Rather too realistic a dream in such circumstances!

The first sounds and sight of the R.A.F. relief planes were too good to be accepted. One heard and refused to believe. One saw and looked again and yet again lest our senses deceived us. The realization of being saved produced deep emotion even to tears. This was followed in some cases by a fear that we had not been seen, or could not be reached or would again be lost. And again, when we were saved and drinking freely in an R.A.F. bomber, flying back to Bahrein, advice was offered that we should drink no more but save our water, in case the bomber became stranded and we again became waterless. I myself in my host's house at Bahrein was about to pour water from a large jug into a basin to wash my hands—when suddenly my raised hand stopped. I could not pour out this fluid, each drop of which was so precious, in such quantity and for so wanton a purpose! And it took a real effort to pour out that water. We owed our thirteen lives to the R.A.F. flight that found us, and to all those of the R.A.F. or of the Imperial Airways, or of the Royal Navy, who stimulated and helped in so rapid a search. To them our gratitude is in proportion to our debt. Had it not been so rapid, it would have been too late.

ON HYPERPYREXIAL HEATSTROKE.

Though no cases of heat fever fortunately arose amongst the passengers or crew of the "Horsa" yet ætiological factors link this condition so closely to heat exhaustion, and the recognition of the factors contributory to hyperpyrexial heatstroke in Indians is so important and their distinctive treatment, if life is to be saved, is so vital that brief reference to hyperpyrexial heatstroke in this contribution seems justified.

My original work on this subject was founded on cases from Mesopotamia—and was published in 1915, under the title of "Malarial

and other Infections as *Ætiological Factors in Hyperpyrexial Heatstroke.*" The main conclusions were :—

(i) In 1915, though the Indian Forces in Mesopotamia outnumbered the British Forces by some 4 to 1, yet 96 per cent of the cases for heatstroke (including effects of heat) came from British troops.

(ii) Amongst Indians, hyperpyrexial heatstroke is rare, and pure, that is, uncomplicated hyperpyrexial heatstroke, due solely to heat, is excessively rare. Indeed, it should be assumed that if an Indian even under atmospheric conditions predisposing to heatstroke develops hyperpyrexia then there is some underlying unrecognized infection which demands diagnosis and treatment.

(iii) In considerably over 50 per cent of cases amongst Indians the causative infection is malaria. It is, therefore, wise to treat all hyperpyrexial heatstroke in Indians as cerebral malaria—until the contrary is proved; especially is this so when such cases develop in a malarious region, or show an enlarged hard spleen, or give a history of recent attacks of malarial infection.

(iv) Amongst Europeans, the possibility of two other common causes should be considered: (a) Exposure to the sun from inexperience and from non-acclimatization, and (b) intemperance.

Acute conditions due to great heat give rise to medical emergencies which demand clear thinking and immediate adequate attention if life is to be saved.

MANILA AND A GOLD MINE.

BY LIEUTENANT-COLONEL M. J. WILLIAMSON, M.C.,
Royal Army Medical Corps.

AFTER noting the title of this article you might reasonably expect that, if you should get to the end of it, a knowledge of Manila, to say nothing of gold mining, will have been acquired. Disillusionment awaits you. This is merely a description of a fourteen days trip to the island of Luzon (Philippines). The capital of the Philippines is Manila and, as the well-known part so often includes the lesser known whole, the title word Manila includes a good stretch of hinterland. In fact, my wife and I spent less than three days in Manila proper.

We were stationed in Hong Kong in 1935 and the question of summer leave cropped up. An early leave was indicated so the Philippines was decided upon. The guide books said that March, April and early May were the months in which to visit Manila, as the rainy season came on in mid-May, and a typhoon might interfere with comfort and plans in late summer.

We started on April 25 in a Canadian Pacific boat. It is only 600 odd miles across so that by the time we were beginning to realize all the amenities this very fine boat offered, the journey was over and the Customs people were demanding if we had anything to declare.

The Philippines are an American Colonial possession and have been since the battle of Manila Bay of 1898 in the Spanish-American war. I had never seen the American in the rôle of colonizer and was interested to learn how the country was governed. I did not have much real opportunity of judging, but superficially the administration seemed to run smoothly and efficiently.

The Customs officers were the first Filipinos we met. Short, solid little men, very polite but inclined to be excitable, they talked good Hollywood English. The general tone of the proceedings was very much akin to that of India, the native race doing Government work under a white control which might or might not be visible. As the bar room orator of the previous night had said, "We Americans are faced right here in Manila with much the same problem as you British are in India and Egypt. The Filipinos want their independence. America says they can have it, and soon. But what's going to happen when we've gone? What's to prevent the islands being swallowed up by the gentleman round the corner who perhaps, is not so altruistic as we are."

Manila looked very charming in the morning sunlight. There is nothing of the grimy port look about the place. A big pier with grey-coloured warehouses juts out from the land and there the industrial side

ends, or at least there is nothing else obviously commercial. The sea wall of enormous, rough-hewn granite blocks, piled up against a sloping bank, runs out along the coast line to right and left. On the top of the wall a line of graceful palms waves gently in the breeze.

There are few houses near the sea front and grass land stretches to the walled city which stands well back. We dumped our bags at the Manila Hotel, which is one of the buildings on the coast road near the pier, and walked up across the grass towards the city. Manila (*intra-muros*) to outward appearances has all the characteristics a Spanish mediæval fortified town would be expected to have, and the imagination conjured up the rounded casque of a Spanish Don bobbing along as the owner strode round the wall. It looked so perfectly preserved with its bastions and massive gateways, that it needed the fluttering flag of a golf course hole to bring the mind back to the present. Then it was realized that, where the moat should have been, there was green sward right up to the walls and that this excellent turf was being put to one of the better uses for such a delightful surface, i.e. a golf course and not at all a bad one either.

Inside the walls the Spanish mediæval atmosphere persists. Narrow streets of balconied houses, with fine old churches and monasteries in unexpected places, carry out the first impression. There are some shops in the main street, but the real business and amusement centres lie outside the walls in the big straggling town which is Manila proper.

One other place we looked at was the aquarium. It is just beside the gate nearest the hotel and is housed in one of the bastions. The fish to be seen disporting themselves in the tanks are really amazing both in shape and colour scheme. We gave the prize to a six-inch fellow. His body was brilliant with red and white stripes, he had a row of poisonous spines on his back and round his neck he wore a large red ruff which billowed in and out as he swam. I believe he called himself an anchorite.

We visited some friends who lived in a bungalow on the coast in the residential area and then turned our thoughts to getting to Baguio. It must come out now; this was the real object of the visit to Manila. Baguio (5,000 feet) is the hill station of the island and is a civil and military refuge from the heat of the plains. In the summer there are quite a lot of American troops up there and they live in the most charming surroundings.

At 6.50 a.m., with rather an effort, we caught the train which was to take us to the foot of the hills. This was no ordinary train; it was air conditioned. As we opened the second of the double doors a pleasant "coolth" struck us and we passed on down a corridor to a spotlessly clean carriage. All the windows were tightly shut and had notices displayed requesting the public to refrain from opening them. It was delightfully comfortable and we were quite sorry to have to leave and face the heat of the day when we arrived at Damartis about noon. Memories of Indian journeys, through similar sort of country, made us hope that this brand of

train might be introduced there before the fates hurl us back for another tour.

The next stage (140 kilometres) was done by motor bus. The road first ran up a valley alongside a stream bed, where the size of the boulders demonstrated the power of the torrent in the rains, and then zig-zagged up the hill side to dive into a belt of pines at the top. These pines heralded the end of our journey ; soon the road mounted a last ridge and dipped down into the saucer-like crater which holds Baguio.

This is Gulmarg, we said. Broadly speaking, it is ; but this plateau is much bigger and, although the hotel, club, golf courses and pine trees all strike notes of resemblance, the tar-mac roads, shops, buildings and the well-built bungalows demonstrate its accessibility advantage over Gulmarg. Some might cavil at the use of the word "advantage" but I think I will let it stand.

The Pines Hotel is the name of the only hotel worth going to. It is a three-storied wooden structure with a large lounge and dining room. Bedrooms are small and sparsely furnished, rather like similar hill-station rooms in India. The majority of guests were Filipinos, but there was a sprinkling of Americans and Europeans.

The plateau is divided roughly into three sections, the municipal area, the residential area and the military area. The municipal area, with its public golf course overlooked by the Pines Hotel, is nearest the terminus of the bus route from the plains. To the west of this lie the spacious looking houses of the civilian element. Then further away still is the Camp John Hay, the Army Lines, complete with golf course. Alongside it is the Country Club, which also has its golf course. This brings us to the outer edge of the saucer and beyond stretches a country of wild looking valleys and tree-clad hills where the gold mines have their being.

It will be noticed that there are three golf courses mentioned in the previous paragraph. We had gone to Baguio with the intention of playing golf and others who go there will probably have the same idea, so I will deal with the golf courses first.

One feature is common to all of them, they have all got sand greens and quite good ones too.

On the first day we tried out the municipal course. It is rather wild and woolly ; as we approached the first tee a horde of cheerful-looking Filipino boys, emitting joyous sounds, descended on us to battle for the honour of carrying our clubs : on the course itself, the usual distractions of a municipal course are met with—family picnics, boys having bicycle races on the fairway, &c. There are some good holes in the nine available and there is plenty of room for the longest hitter.

The Country Club is about three miles from the hotel. It is a very pleasant spot with a residential section. It is very difficult to get a room there in the season as it is all booked up some time ahead. The course is

charmingly pretty with pine bordered fairways and very little level going. It is a full eighteen holes, but I cannot remember a hole in which the green was out of reach of two full shots.

The Camp John Hay course is close to the Country Club course and the terrain is similar. It is, however, a much stiffer proposition than its neighbour. Some of the holes are really long, but the one which intrigued us most was a 250-yard one with the hole at the top of the steepest slope I have ever met as a fairway. This course is reserved for the Army officers and men. I was told I should require an introduction to get a game on it, so, on the second day of our visit, I walked across to the camp hospital. The officer commanding and his staff showed us the truest hospitality. I say "us" because later on my wife was included in the programme they made out for us.

The hospital was on much the same lines as an I.M.H. in India. Most of the patients were Filipino soldiers. Apart from the two American officers and an American nursing sister, the staff was entirely Filipino. It included a senior rank who corresponds to a sub-assistant surgeon. I met him in the laboratory engaged in doing a blood-count. From the answers he gave to the Commanding Officer's questions he obviously knew his job.

A Hong Kong American friend had given us some notes of introduction to a civilian or two, so with golf matches and the social round the days flew by.

We had some moments of anxiety as to our return journey when a revolution broke out. It was, however, a poorly organized show run by some half-baked communists who inveigled a few witless peasants in small towns to make an insurrection gesture; it was little else. The rioters were badly armed, badly led and had very little idea of what their object was. It all fizzled out after the first blaze with a minimal loss of life. It did not seem to affect life at Baguio at all and the only difference it made to us was when one of our golf partners had to go off suddenly and investigate a riot instead of completing our four-ball.

It was the evening of our second last day when the 'phone bell rang. A friend had arranged for us to go down a gold mine next day. We had been trying to fix this up since we arrived and had given up the idea altogether as the next day was Sunday, but we had underestimated the depths of American hospitality.

Next day a car took us up past the Country Club and over the edge of the saucer. The tar-mac surface soon disappeared and, as we went down the hill, the road grew rougher and rougher. Washouts were obviously to be feared on this hillside road, particularly as we had had quite a lot of heavy rain in Baguio during the last few days. Our fears were justified and it was not long before we came upon a large gang of coolies standing beside a bit of road that was just broad enough to take a car, and only too obviously just made up. It was the complete Kashmir road picture with the various well-known features all present, viz. the steep khud side, the

grinning natives and the anxious moment when it was doubtful if the outside edge of the road would stand the wheel or not.

We could see the gold mine buildings far away down below us in the valley bottom and it took us an hour to get there, but the driver knew his job and landed us and the car intact.

We were met by the chief engineer who said he was going to show us round. He was clad in dungarees shoved into laced-up top boots and Sunday was not his shaving day. He looked scornfully at our comparatively pansy looking kit and said, "Wal, I guess you're not expecting to go floppin' about in the mud of the galleries so you'd better come into the office first and then we'll have a look at the bodega."

We followed meekly in and he ranged us up beside a model of the mine in a glass tank, transparent so that its depth and ramifications could be seen from top and sides. Then he began to talk. It did not take long to realize that we had before us a real enthusiast. His flow of information went on during our whole visit irrespective of his surroundings. The row in the factory (bodega), where quartz grinding machines, turbines and separators, each made their own strident note, was awe inspiring, but these mobile lips kept pouring out words while I, rather hopelessly, tried to balance on a plank and keep my better ear towards him. The pity of it was that the man was intensely interesting and I regretted that, perforce, I missed so many of his flowers of speech and so much golden information.

I cannot convey anything of his dramatic fervour, but I hope that the few paragraphs which follow may give some idea of how the miracle of producing gold from stone is performed.

The presence of gold in the Philippines has been known for hundreds of years. The Igorots, who are the aboriginal natives, achieved no mean state of civilization which included the discovery of how to get gold from quartz in their developmental progress through the centuries. Their old workings are still extant and the gold they produced was good, although, I gather, the processes they used have vanished in the sands of time.

The auriferous quartz on fracture is brilliant white, flecked with gold-like iron sulphide, anthracite, and manganese. In the Philippines the quartz layer may be 1,000 feet in depth, as it was in this mine. Galleries are driven into the quartz vein at different levels on the hill side. The mined quartz is dumped into a chute which runs through the various levels from the top to the ground floor. From there a light railway takes it to the factory, where it is weighed and heaved into the maw of a crusher. These crushers are arranged in series, each one breaking up its feed more finely than the last. As the quartz passes into the jaws of these monsters it is sprayed with hydrocyanic acid. By the time the last crusher has done its work the result looks like liquid mud. This is slid off into enormous round separator vats where more hydrocyanic acid and some barium are added. Here the solids are allowed to settle after whirling paddles have done some churning. The dirty supernatant fluid now goes on to a tank

called a vacuum extractor. In this is a series of double canvas plates with a perforated tube in each. The vacuum is turned on inside the hollow plates and sucks the fluid through the canvas. The fluid drains away through the perforated tube. It is mainly hydrocyanic acid and contains all the dissolved gold. This gold is then extracted with zinc, and the end-result is a coal black sludge which in this mine is a mixture of gold and silver. I am not at all clear if silver always goes hand in hand with the gold in quartz or not, but anyhow in this case it did.

The final affair we did not see. It happens twice a month and is made an excuse for a cocktail party at the mines' office. All the sludge end-result for the previous fortnight is put into an enormous crucible and heated up to some fabulous temperature. The ladies are then invited to come and watch the "pouring of the gold." This consists of the filling of brick-like moulds with molten gold. The bricks in this mine were rather anæmic looking owing to the silver in the quartz. The final refining is done at 'Frisco.

In Hong Kong I had been advised to put my money—or some of it anyway—into these gold mines, so I asked our friend what would happen to the mines when the Islands were handed back to the Filipinos. He hedged a bit as to the ultimate upshot, so we decided that the island mines might be even more of a gamble than gold mines proverbially are.

After thanking our host, we went back to the hotel to get ready for an early morning flight down to Manila. Flying is much the best way of getting up and down. The baggage goes by train and 'bus, while the aeroplane does the journey in an hour.

Manila is a good place for a short spell of leave. It is a complete change from anything to be seen in China or Japan. The best time of year to go is March and April, and it should not be left till later. We had the misfortune to arrive in Baguio the day the rains broke, and, although we played a lot of golf between showers, it absolutely prevented us going trips further afield than the gold mine, as we had meant to do. There is some wonderful country to be seen, and the natives outside the town zones are interesting if the investigation of a somewhat primitive civilization appeals. Dry roads for this, however, are essential as the rains make a bogged car pretty nearly a certainty.

THE PREVENTION OF VENEREAL DISEASE WITH SPECIAL REFERENCE TO PREVENTIVE ABLUTION CENTRES.

BY LIEUTENANT-COLONEL ALEXANDER HOOD, M.D.,

Royal Army Medical Corps.

It is well known that in spite of education, provision of other attractions, lectures, and the withdrawal of privileges, a certain number of men will inevitably expose themselves to venereal infection.

To prevent the consequences of this, the most hopeful line appears to be the provision of some adequate means of disinfection. This is done by prophylactic packets and preventive ablution centres. The former have many disadvantages which militate against their proper use and which are quite obvious. These would be more generally appreciated by questioning those who state they have used the packets; it is, in my experience, quite exceptional to find that the packets have been used in the way they are intended.

It is therefore apparent that the main hope rests in the preventive ablution centres.

Some excellent advice on the equipment and management of these centres is given in Appendix III, Memoranda on Venereal Diseases, 1936, but the great weakness in the system is that the man has to carry out his own treatment. The attendant in charge of the room considers that his duties are to be in charge of the equipment, to keep order, and to see that tickets and counterfoils are correctly filled up. He has little time for anything else.

A large number of the men who use the room are content to do so in a perfunctory manner in order to obtain a ticket which may absolve them from the loss of privileges later. There are many factors accountable for this: fatigue, alcohol, hot weather, a desire to get back to barracks, etc., all play their part.

It was, therefore, thought that if trained attendants could be provided who would actually carry out the treatment thoroughly, then at least those men who had the sense to go to the preventive ablution centre would have the best possible chance of escaping infection.

The first step was to persuade the officers commanding units that this method would be to the benefit of their men. A conference of all Officers Commanding was held and the proposal explained and discussed, and eventually it was decided to try it. Volunteers were called for from units and nine men were selected; these men were sent to the Specialist in Dermatology and trained thoroughly in their duties, the course lasting one week.

Extra duty pay for these trained attendants was provided from Brigade funds.

In order to have some check on the treatment, the attendant who carries it out enters his name on the back of the counterfoil which the patient fills up before he leaves the preventive ablution centre, and failures in treatment entail the loss of extra duty pay for one week for the attendant concerned—drastic and possibly unjust at times, but very efficacious.

In addition to the ordinary equipment of the centre, the attendants were provided with gowns and rubber gloves, and the room was divided into cubicles for treatment.

The ordinary routine treatment, as described in Appendix III, Memoranda on Venereal Diseases, 1936, was used.

The administration of the centre was under the D.A.P.M., who arranged the roster of duties; two attendants were on duty daily and three at week-ends.

As is the case in most garrisons abroad the area from which venereal infection is likely to be contracted is well defined. The preventive ablution centre was situated in that area.

Prior to taking up their duties, the attendants were interviewed; the importance of these duties, both from the individual and the unit point of view, was stressed, and in addition they were warned of the confidential nature of their duties. One danger was foreseen, and that is that actual treatment of the declared disease is undertaken *sub rosa*. The N.C.O. i/c and the orderlies must thoroughly understand that prompt and severe action will be taken against the offender in such a case.

On February 10, 1936, the scheme was put into operation; after it had been running for a few weeks a Serjeant, R.A.M.C., who is a qualified S.T.O., Class 1, observed the treatment for one night and reported that it was being carried out satisfactorily.

Results from February 10, 1936, to December 31, 1936 :—

Number treated	Failures	Percentage of failures
4,367	8	0·18 per cent.

The eight cases were two soft chancre and six gonorrhœa, and of the gonorrhœa cases one man showed his first signs forty-one days after treatment—with the probability of an untreated exposure in the interval.

In "Venereal Disease in General Practice" Harrison quotes American statistics for a somewhat similar scheme, and in these the percentage of failures varied from 0·08 and 0·59, where treatment was carried out within one and two hours respectively, up to 7·40 when treatment was delayed for more than ten hours. This last figure gives an interesting indication of the risk run without treatment, and while it is impossible to give any accurate estimate, it seems probable from a cross-examination of more than 150 recent cases of venereal infection during the past three years that 2 per cent. is a very conservative estimate in this country (Egypt), therefore :—

(1) 4,367 known exposures who passed through the preventive abluion centre, if untreated, would have yielded 87 cases.

(2) They actually yielded eight cases.

The risk of infection for men who can be induced to use a preventive abluion centre, such as described, is less than 0·2 per cent.

One of the arguments used against treatment by attendants is that it will defeat its own purpose by driving men away from the preventive abluion centre because of the publicity they are likely to incur. There is a certain amount of truth in this, and at first this will happen, but if the attendants are carefully chosen and if they do not talk about their work the reputation for skilled treatment will counteract any preliminary falling off in attendance at the centre.

Primary infections contracted locally from February 10 to December 31, 1936, are shown in the following table :—

		Number of cases	Number used P.A. centre	Number used P.T. packets only	No treatment
<i>1935</i>		49	28	11	10
Average strength ..	.. 2,036				
Ratio per thousand ..	.. 24·06				
<i>1936</i>		41	8	11	22
Average strength ..	.. 1,875				
Ratio per thousand ..	.. 21·86				

This table shows a slight reduction in the actual admissions but a very marked rise in the number who used no preventive treatment. This was partly due to distrust to begin with and partly to a temporary move of the centre of infection, and because some men stated that they used a preventive abluion centre in barracks themselves (which has since been discontinued) but of which they gave no proof.

The number of men who became infected after treating themselves at the preventive abluion centre in 1935 is in marked contrast to the number who became infected in 1936 (28 against 8) and bears out what has been said above about the perfunctory use of such a centre.

It is too early to state definitely that the scheme is successful and an improvement on the ordinary preventive abluion centre, but it seems worth a continued trial.

The co-operation of regimental officers, more especially the platoon officer, who will insist upon the obvious necessity of taking advantage of the preventive abluion centre in those who must expose themselves to infection, is most necessary.

Editorial.

THE STATE OF THE PUBLIC HEALTH.

In an editorial published in the April number of the Journal we dealt with the sections of Sir Arthur MacNalty's Report dealing with vital statistics and epidemiology.

In Section V on maternity and child welfare Sir Arthur states that these services had their origin in voluntary effort. He writes that: "In the eighteenth century Sterne, in 'Tristram Shandy,' describes how the wife of a parson had a poor widow trained to become the parish midwife and paid the fees for the ordinary's licence to enable her to practice. Lying-in hospitals were established in populous centres and similar work was done by the maternity departments of the voluntary general hospitals and by the Poor Law hospitals. The Midwives Act of 1902 reduced the ranks of unqualified handy women, and the Central Midwives Board brought the practice of the midwife into order. The duty of inspecting midwives was vested in the County and County Borough Councils. Similarly, child welfare centres began on a purely voluntary basis, and the Local Authorities are now the heirs of this work. Much of the value of these centres still depends on voluntary effort and on the helpful co-operation of County, Municipal and District Nursing Associations."

Though great advances have been made in medical science and public health services, the death-rate of women in childbirth has remained almost unaltered. The number of mothers who died in childbirth in 1935 was 2,457—a small number in comparison with the number of births, which was 598,756. Yet it is estimated that at least one-half of these deaths might have been prevented.

In 1935 the death-rate was 4.11 per 1,000 live births, compared with a rate of 4.6 in 1933; this reduction, though welcome, is not enough.

For nearly two years specialist medical officers of the Ministry, in conjunction with the Medical Officers of Health of various areas, have been investigating the causes of maternal deaths. The investigation has not been completed, but it is known from the findings of the Departmental Committee that an efficient service of salaried midwives is essential, and for this reason the Minister of Health introduced the Midwives Bill in 1936 instead of waiting for the special investigation to be completed.

Experience has shown what can be done by a well organized midwifery service. The number of deaths among mothers attended by nurse-midwives employed by a nursing association is only 2 per 1,000 births—about half the national rate. The midwives sent to the homes of mothers by two voluntary hospitals in the East End of London have during the last ten years lost less than one mother per 1,000 live births.

The main purpose of the Midwives Act is to supplement these services by setting up a comprehensive service of salaried midwives who must be whole-time servants of the body that employs them, but need not give the whole of their time to midwifery. Under the Act, midwives in practice will be required periodically to attend courses of instruction and so keep up to date in their methods. Those appointed to the new service will be assured of adequate remuneration.

In the section devoted to tuberculosis attention is drawn to the fact that sociological problems arising from tuberculosis in the household are often as urgent in the interests of the patient and of the family as the medical treatment of the individual sufferer. Home conditions may interfere with the fulfilment of the instructions and supervision given by the staff of the dispensary. The spread of infection may be minimized by the loan of beds and bedding enabling the patient to sleep alone; the family may need to be transferred to a larger house. In London and Sheffield there are excellent housing schemes for the tuberculous, and in Sheffield the rent of the home may be paid on condition that the patient occupies a separate bed and bedroom, that no lodgers are taken, and that the tuberculous person shall attend the dispensary and be advised by the Tuberculosis Officer. The Care Committee can work hand in hand with the local authority in these rehousing schemes.

In other instances it may be desirable to make arrangements for the boarding out of the children of infected parents so as to allow the mother to go away for treatment. Such a scheme is now in operation by the London County Council.

As regards after-care work, it is stated that the first two years after leaving a sanatorium are very critical. The patient must live in as healthy an environment as possible, and should only work in an occupation suitable to his condition. Usually these requirements can only be satisfied by life in a village settlement such as the Papworth Village Settlement. But a large proportion of patients cannot get such treatment; and for them small workshops have been established at Bristol, handicraft centres in London boroughs, and municipal workshops in Northamptonshire.

It is suggested that a more hopeful field would be the provision of workshops at sanatoria. Birmingham has a workshop of this nature at the Municipal Sanatorium.

There have been considerable falls in mortality from respiratory tuberculosis during three out of the last four years. In 1935 there were 11,186 fewer deaths from tuberculosis than in 1925, although the population had increased during the interval, and the figures for 1935 constitute a new low record, probably aided by the absence of undue prevalence of influenza and by favourable climatic conditions.

In the Chief Medical Officer's report for 1934 reasons were given for the

belief that the Local Government Act of 1929 had improved the efficiency of the venereal diseases schemes of Local Authorities. The experience of 1935 has shown further evidence of activity of Medical Officers of Health to improve the Venereal Disease Treatment Centres and to strengthen the links between venereal disease and other branches of the Public Health Service.

There were 185 Venereal Disease Treatment Centres in England and Wales in 1935. The annual returns of the centres afford reliable evidence of the incidence of syphilis in this country. Cases of syphilis dealt for the first time at the centres rose to a maximum of 42,805 in 1920, then fell to 22,010 in 1924 and remained stationary until 1932, when a new fall commenced and in 1934 a low record of 20,692 was reached. The fall continued and in 1935 the number was 19,335. There has been a steady fall of congenital syphilis in the numbers at each age group except that of 15 years and over.

An important question is the effect of venereal schemes on the wastage of life from late manifestations of syphilis. This wastage generally occurs between 30 and 60 years of age when people are of the greatest value to their families. In discussing the late effects of syphilis it is stated that the field is practically limited to three diseases: General paralysis of the insane and tabes dorsalis, which are always due to syphilis, and aneurysm which is caused by it in a very high proportion of cases.

Deaths from general paralysis of the insane, however, are no longer an index of the late effects of syphilis as the disease is now curable by malarial therapy. The mortality from tabes dorsalis is also not a good index as the disease is often arrested and little is known of the effects of modern treatment. Deaths from aneurysm may be the best index, but this is complicated by the fact that during the Great War a large number of men were infected with syphilis. Between August, 1914, and November, 1918, approximately 100,000 men in the British Army (excluding Dominion, Colonial and Indian forces) were treated for syphilis; and between the close of the war and demobilization the incidence of venereal disease in the Army greatly increased. One would expect this increase would be evidenced by late effects of syphilis. A graph of G.P.I. supplied by the Board of Control shows as regards admissions that there was a marked fall from 1918-20, then a rise occurred in 1922 and 1923, and after this there was a gradual fall to 1935. In the four years 1931-34 the direct admissions were 23 to 25 per cent fewer than in the four years 1911-14 and the deaths were less than half. The explanation of the marked fall in 1918-20 is not easy; the institution of the Venereal Disease Scheme in 1916 could hardly be responsible for the decline in deaths from G.P.I. shown in the Registrar-General's returns, seeing that this effect of syphilis does not usually show itself until ten years after infection. Deaths from tabes dorsalis have shown no striking changes in numbers since 1920, and deaths from aneurysm show an increase, but the rates for males in the

age-period 30 to 60, when this effect of syphilis generally manifests itself, show fairly substantial decreases.

The number of deaths from cancer was 64,507, or 1,244 in excess of the previous year. The deaths among males were 30,780, and those among females 33,727. The total mortality-rate of 1,587 per million of the population living shows an increase of 24 over the previous year. The mortality figures alone provide little evidence that the efforts to obtain control of this disease are making headway.

The increase in mortality is affected by the increasing longevity of the population and the more accurate diagnosis of the disease. When these factors are taken into consideration it is considered quite fallacious to assume that the increased frequency of the disease connotes a greater prevalence of whatever factors are concerned in the causation.

The subject of cancer has been of great interest to the Ministry for the last thirteen years or so, and it is claimed that advances have been made in investigations of causation, improvements in diagnosis and treatment, and even, to a limited extent, in prevention. *Ætiological* research has in the main been concerned with carcinogenic substances and virus diseases.

In an editorial last month we gave full details of the researches carried out on these lines for the British Empire Cancer Campaign. The most significant discoveries have been the demonstration that the carcinogenic substances in tar, etc., are closely allied in chemical constitution to the sterols, bile acids and sex hormones produced in the human body, and that some derivatives of them are active cancer producers under experimental conditions. Very important also are the discoveries that malignant tumours of fowls can be transmitted without the intervention of living cells, presumably by a virus, and that a carcinogenic substance may exhibit the feature of transmissibility by cell-free extracts so characteristic of the virus-produced tumours. It has also been found that a tumour transmissible to a mammal can be produced by a cell-free extract, and that an apparently simple tar tumour may display malignant characters following injection of cell-free filtrates of the naturally occurring tumour.

The development of instruments of greater precision, particularly in the sphere of radiology, has increased the ease and certainty with which the disease can be identified. Early diagnosis has also enabled treatment to be given when it is more likely to be effective.

Notable advances in treatment have been made by the substitution of radiation methods for operative treatment. They can be used in cases in which operation would be impracticable. But they are not to be regarded solely as substitutes to operation methods. They play an important part as adjuncts to operative treatment.

Prevention, unfortunately, is limited mainly to those cancers which have been recognized as due to occupational risks, such as needless exposure to

radiations by those engaged in the manufacture of radio-therapeutic appliances. X-ray cancer is now almost extinct. The elimination of skin cancers due to exposure to mineral oil, tar, soot, etc., may now be confidently expected as a result of the researches to avoid or counteract the carcinogenic action of these substances.

During the year under review the Ministry's Advisory Committee on Nutrition has been reconstituted and enlarged. It has presented a memorandum to the Minister of Health and the Secretary of State for Scotland on the nutritive value of milk. The memorandum calls attention to the fact that milk contains, in a form ready for utilization by the body, practically all the materials essential for growth and the maintenance of life. It points out that the present consumption of milk is only about 0·4 pint per head per day and in many families it is much less. It suggests that children should have daily between one and two pints, and expectant and nursing mothers about two pints. A minimum of half a pint of milk a day is desirable for an adult, especially as calcium frequently deficient in a diet is most conveniently given in the form of milk. Dietary studies, tests of nutritional efficiency, and milk investigations are being carried out for the Ministry.

Attention is drawn to the importance of protective foods, and a recently published report from the City of Bristol Public Hospital Services claims to show that an increase in protective foods in a dietary is of value in the presence of intestinal affections arising in the inmates of an institution.

The Milk (Special Designations) Order, 1936, the Bacteriological Grading of Milk, and the Supervision and Control of Pasteurizing Plants are discussed at length. We have drawn attention to these subjects in Editorials published in 1936, and no new points have been brought to notice since then.

In the Section on imported foods there is a note on the bacteriological quality of butter. Samples of Russian butter examined in the Ministry's laboratory were found to be entirely satisfactory and free from pathogenic organisms. Samples of butter from Australia and New Zealand were examined bacteriologically and by animal inoculation: they were of good bacterial purity and no suspicion of the presence of pathogenic organisms was indicated in any sample. Similar results were obtained with samples of Danish butter. Samples of English butter were also examined: they proved less clean than samples examined from Australia, New Zealand and Denmark and also from Russia.

In 1935, 137 outbreaks of suspected food poisoning were reported to the Ministry. Of these 116 were investigated in the Ministry's laboratory; 12 were excluded as not due to food poisoning. Of the remainder 53 were due to *Salmonella* infection, and in 46 a *Salmonella* was isolated either from the patient or some article of food or from both. In 12 outbreaks dysentery bacilli—*Sonne*, *Flexner*—were responsible for the attacks.

In forty-seven outbreaks the symptoms suggested a bacterial "toxin";

the majority of the foods concerned were canned fish, potted meats, and pickled or pressed beef. Corned beef outbreaks which used to be the commonest toxin outbreaks have practically disappeared, only one being reported to the Ministry. This disappearance is probably due to the efficiency of modern canning of beef.

From the suspected food cultures of staphylococci, usually *aureus*, were obtained in twenty-one instances, in nearly all these the staphylococci predominated so greatly over other bacteria that their connexion with the toxicity of the food was highly probable. It is thought that other bacteria, especially streptococci, may grow vigorously in food without causing change in its appearance or taste. It is probable that their toxicity is due to enormous growth and the presence of excess of bacterial protein, rather than to any toxin or product of protein decomposition.

A large outbreak in Lancashire was traced to meat infected with *B. typhi murium* (aertrycke). The meat was eaten as pressed beef. An unusual outbreak in Yorkshire was attributed to a cook who was suffering from an untreated sinus wound. Pus from the sinus contained *B. typhi murium* in pure culture. This was the type isolated from the cases who consumed the food prepared by the cook.

The first recorded outbreak of botulism in Great Britain occurred in 1922; since then there had been no authenticated cases until 1935 when three deaths due to botulism occurred in the North of London. The cause of the illness was the consumption of a vegetarian food called nut-meat brawn contained in air-tight glass jars. *Clostridium botulinum* was isolated from the remains of the nut-meat brawn which had been eaten by the patients who died of botulism. *C. botulinum* occurs in soil and it is probable that the vegetables used in the preparation of the nut-meat brawn were contaminated with this organism. *C. botulinum* is an anaerobic spore-bearing organism, and it is considered that the two hours steaming to which the brawn was subjected would not kill the spores. During its growth the microbe produces a toxin and it is this which is responsible for the production of botulism.

Exposure to a temperature of 120° C. for four minutes will kill the spores, but obviously it will take a considerable time for food packed in air-tight containers to attain a lethal temperature. In this connexion what is known as "home-canning" of vegetables is especially fraught with danger. An examination of the records of a number of outbreaks of botulism in the United States has shown that outbreaks attributable to the consumption of home-canned products are much more numerous than those attributable to factory-canned products.

Later in the month of August another fatal case occurred in London. The findings at autopsy were consistent with death from botulism and the remains of the food eaten were proved to contain a certain amount of toxin neutralizable by botulinus antitoxin in animal experiments. Dr. A. A. Miles reported the isolation of *C. botulinum*, type B, from the

food. This is the first occasion in which this type of the botulinus bacillus has been obtained in this country in connexion with a human case.

In the section devoted to Statistical Research attention is drawn to a statement of the Government Actuary that the graduated rates of mortality for males show a maximum rate at 23, followed by a decrease to the age of 26, when the minimal rate occurs: thereafter the rates steadily increase from age to age. In the case of females there is no instance of decreasing rates of mortality in this span of life, but there is a decided retardation in the progression of the rates. It is suggested that as the feature is more pronounced in males than females, there must be some special factor operating at these ages, and that is probably the increasing share of accidents in total mortality. The kind of accident is death on the roads and in the air. In 1920-22 the death-rate per 100,000 of males aged 20 to 25 from the principal categories of accident was 39.9. Road and air transport accounted for 9.5. In 1930-32 the rate was 65.4 and road and air transport accounted for 43.2. It would appear that out of every 10,000 young men attaining the age of 17 about 75 per cent will have died a violent death before reaching the age of 30, if the rates of 1930-32 hold.

Among the investigations carried out under the Auxiliary Scientific Fund was an investigation under the direction of Professor Topley on nasopharyngeal flora. Some interesting results were obtained in connexion with "colds." Examination of muco-pus collected in sterile handkerchiefs showed that while the discharge was merely watery cultures yielded at most but a few white staphylococci. Once the discharge became thick and yellowish, however, significant results were always yielded by cultures. Though the data are not extensive they support the view that the acute "cold" is initiated by a filtrable virus, while bacteria play an important part as secondary invaders.

Malaria therapy has been continued at Horton under Colonel S. P. James, F.R.S. During the year 122 patients received treatment, the particular species of malaria used were *P. vivax* (69 cases), *P. malariae* (35 cases), *P. falciparum* (16 cases), and *P. knowlesi* (2 cases). Trials were made with *P. knowlesi* to see if it could be used on a large scale in place of *P. vivax*. Similar trials are being conducted in Edinburgh and Roumania. In several recent years other species of malaria than the benign tertian type have been supplied for cases which had ceased to react to infection with that type, or for which a second course of treatment was required. Twenty hospitals were supplied with quartan malaria for that purpose, and one hospital with malignant tertian.

Following on the researches of Rogoff and Stewart, Hartman and his co-workers, and of Swingle and Pfiffner, preparations of suprarenal cortex have been used for the treatment of Addison's disease. Swingle and Pfiffner describe the principle isolated by them as the "adrenal cortical hormone."

Some physicians claim that the cortical hormone is as valuable in the treatment of Addison's disease as insulin in diabetes.

The objects of the treatment are to ward off death in a crisis and to ameliorate the general symptoms.

Cameron writes that when treatment is commenced early, patients may be maintained for many years in normal health and working capacity.

Recent research on diabetes by Himsworth and by de Wesselow and Griffiths seems to show that the severe form of the disease occurring mainly in young subjects, and the comparatively mild form in older patients, may have a different ætiology. Himsworth has suggested that the efficacy of insulin depends on the presence of an insulin-sensitizing factor, and a type of diabetes may occur not due to lack of insulin but to deficiency of the sensitizing factor. Two types can be distinguished, the "insulin sensitive" in which insulin produces immediate suppression of hyperglycæmia and the "insulin insensitive" when it has no effect. The nature of the factor is not known. The "insulin insensitive" type appears to be more common in the elderly and the "insulin sensitive" common in the young.

Professor de Wesselow and Griffiths have considered the possibility of the pituitary having a relation to diabetes. They found that the blood-plasma of elderly diabetics when injected into rabbits diminished the hypoglycæmic action of insulin in a manner resembling that found by other workers to result from the injection of extracts of the anterior pituitary gland. Plasma from young diabetics and normal controls had no such action. The relation of these findings to those of Himsworth is not clear.

These researches at any rate indicate that the clinical differentiation of diabetics into two main types rests on a sound ætiological basis and emphasizes the importance of further research on the influence of the endocrine glands, other than the pancreas, in connexion with the genesis of diabetes.

Important work on the treatment of diabetics by protamine insulate has been done during the past year by Hagedorn and his associates. By combining insulin with certain protamines Hagedorn claims that it is less rapidly absorbed and is taken up by the organism at a more even rate. It is not asserted that the new preparation can entirely replace insulin and that it is suitable for the treatment of all cases of diabetes. The rapidity of absorption of insulin is of great importance in diabetic coma and other emergencies. The protamine preparation has been found valuable in severe cases of diabetes, especially those in which "insulin reactions" are experienced in greater or less degree. It is especially in the night that these reactions are most troublesome to the patient, and the best results are stated to be obtained by giving protamine insulate in the evening, and ordinary insulin in the morning. In this way the risk of hyperglycæmia in the night is avoided, and the high level of sugar in the morning controlled.

Clinical and other Notes.

A CASE OF AURICULAR FIBRILLATION WITH RECOVERY.

BY MAJOR P. J. S. O'GRADY,
Royal Army Medical Corps.

Sergeant R. C. W., aged 38. Eighteen years' service.

A. Previous History.—Joined the Army in 1916 from school, at age of 17.

His first admission to hospital was for dysentery (amœbic) at Meerut, in 1920. Had malaria in Jamaica, 1928.

No history of rheumatism, chorea, or previous cardiac valvular disease.

His symptoms began at Rawalpindi in the spring of 1934. He complained of fluttering sensations in the precordium and vertigo, especially on stooping, and on one occasion lost consciousness. In May of that year he went to Gharial, where his symptoms became intensified. There he developed dyspnœa, which was experienced when at rest and markedly increased at exercise. There was a complete absence of pain at first, but later he had anginal pain which woke him up at night, and was accompanied by marked dyspnœa. He had to sit up in bed for hours.

He reported sick with these symptoms and was admitted to hospital. The marked irregularity of the pulse was noted, but no organic lesions were discovered. He was treated with digitalis which appears to have benefited him, in that the irregularity improved considerably. He was discharged to "Light Duty."

At a medical examination in October, 1934, for fitness for a machine gun course, the medical officer concerned suspected his condition and admitted him to hospital.

Radiograms were taken. A diagnosis was made. He was invalided home. Admitted to Royal Victoria Hospital, Netley, March 16, 1935.

B. Condition on Admission.—A man of small stature, healthy looking, and not a bit worried about his condition. There is a complete absence of subjective symptoms. There is no hyperthyroidism. No tremors. He has not been losing weight. Sweats rather easily. No bony changes indicative of rheumatism. His oral hygiene is good, and tonsils and fauces look healthy. The right pupil is larger than the left, but reacts to light and accommodation.

Cardio-vascular system: Apex beat difficult to locate, but probably in fifth interspace just inside the nipple line. No thrills palpable or murmurs audible. No clinical cardiac enlargement.

The ventricular rate as counted at the apex by auscultation is 62. The rate of the radial pulse is 50.

Pulse: Thready. Is irregular, and the irregularity is accentuated by increasing the pulse-rate. Jugular pulsation is present, one wave being visible during ventricular systole. The blood-pressure varies with each heart beat.

Radiologically, the heart is within normal limits of size. Heart—lung coefficient 2:1. Red blood-corpuscles 3,890,000. Hæmoglobin 80 per cent. Urine contains no albumin or sugar. Knee-jerks and ankle-jerks sluggish. Wassermann-Kahn reaction negative.

Fig. 1 is a cardiogram taken on March 15, before any treatment, beyond rest in bed, was carried out.

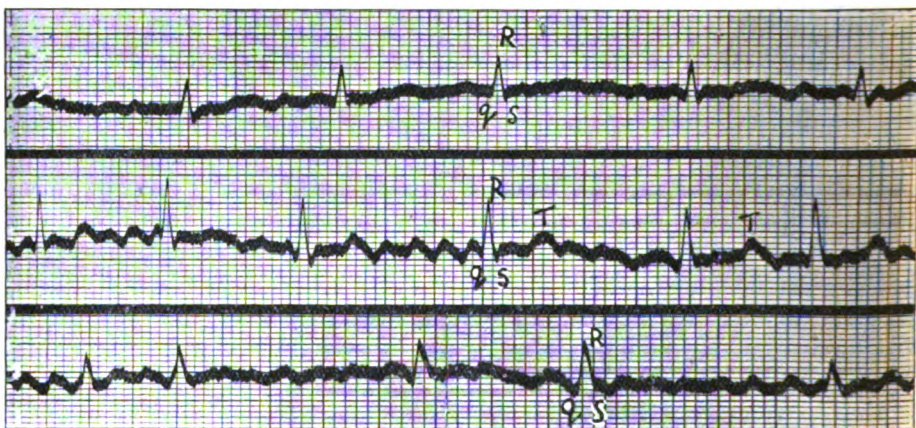


FIG. 1.

It shows the Q, R, S complexes to be normal in all three leads. P waves (auricular) are absent, proving the case to be one of auricular fibrillation. T waves are satisfactory in lead 2, but are not very prominent in lead 1.

Treatment and Disposal.—The patient was kept at rest and stopped smoking. As digitalis had formerly been exhibited it was decided to try quinidine. Accordingly on May 6, six grains, as an experimental dose were given. No ill-effects resulted.

On May 7 he was given quinine, six grains three-hourly (four doses). At 11 p.m. that night the patient who was asleep states that he suddenly woke up with a sensation of a “highly tensed wire suddenly breaking inside his head, and at the same time he was conscious of his heart “changing gear-like.”

On May 11 his heart rhythm had become normal, and remained so until he was discharged May 28.

His Wassermann-Kahn reaction was re-tested and was again negative.

Fig. 2 is a cardiogram, taken May 20, nine days after his metamorphosis. It shows normal rhythm and normal P, Q, R, S, T complexes.

He was seen by the Consulting Physician to the Army about this

period, who considered there was no reason why the man should not be returned to duty. Accordingly, after advice as to his mode of living for some time, he was given a month's sick leave, and thereafter to return to duty. He had about two and a half years of unexpired service.

The case was being kept in touch with through annotation in his medical history sheet.

I had a letter from this patient on September 18, in which he informed me that he was quite well. He was on manœuvres this year.

On March 1, 1937, the patient was stated to suffer from a little dyspnœa on exertion, but otherwise was quite well. He was still serving.

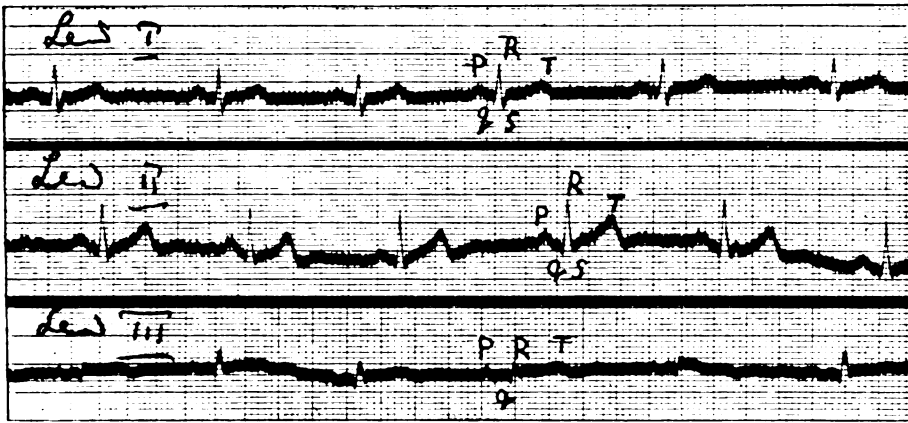


FIG. 2.

I am indebted to Dr. Harold Bower and to the staff at the Royal South Hants Hospital, Southampton, for their kindness in taking the necessary electrocardiograms; to Colonel A. D. Fraser, D.S.O., M.C., Officer Commanding R.V. Hospital, Netley, for permission to forward these notes, and to Major W. R. Spicer, R.A.M.C., for his valuable help in treatment.

The case has been followed up, and when seen in February, 1937, was perfectly well with no recurrence of symptoms.

A CASE OF GLANDULAR FEVER OR INFECTIVE MONONUCLEOSIS.

BY CAPTAIN R. ST. J. LYBURN,
Royal Army Medical Corps.

ON October 1, 1936, the patient, a girl, aged 13, was admitted to the Families Hospital, Moascar, complaining of slight sore throat and being off her food. She had been ill for ten days before admission, and during this period had been running a remittent temperature varying between 99° F. and

101° F. Several blood slides were found negative to malaria parasites, but a lymphocytosis of 80 per cent was discovered. A blotchy rash appeared on the face about the sixth day after the commencement of the illness. It lasted only one and a half days.

On admission the child looked pale and undernourished. The temperature was 99·4° F. and pulse 116. There was definite enlargement of the following groups of lymphatic glands: Posterior cervical, submental, axillary, and to a lesser extent the inguinal. The epitrochlears were not affected. The glands were small and discrete. They were not tender. The spleen was found to be palpable, and the lower border of the liver could be felt two fingers below the costal margin. Examination of the respiratory and other systems showed no abnormality. The fauces, teeth, ears, and sinuses were normal. The urine showed a trace of albumin.

There was no family history or previous illnesses of any relevancy.

During the fortnight subsequent to admission the remittent pyrexia continued—maximum 101° F. The pulse varied between 88 and 120; the lymphatic glands became more enlarged. Blood cultures were sterile. The Widal reaction was in keeping with recent inoculation with T.A.B., and showed no agglutination with *Brucella melitensis*. The Weil-Felix reaction was negative.

Blood Examination (October 9, 1936).—Red blood-cells 4,750,000; hæmoglobin 90 per cent; colour-index 0·9; total white cells, 9,400; polymorphonuclears 34 per cent; lymphocytes 60 per cent; mononuclears 6 per cent. Arneth index 1/0, 2/14, 3/54, 4/28, 5/4.

The Wassermann reaction was negative. The blood-serum was sent to the Citadel Laboratory for Lehnendorff's test—to be examined for the presence of heterophile antibodies. A titre of 1:60 is taken as being pathognomonic of glandular fever. The result was returned positive in 1:240 dilution.

In view of the generalized glandular enlargement, lymphocytosis and positive Lehnendorff's test, the case was diagnosed as one of glandular fever or infective mononucleosis.

On October 15, the enlarged spleen and liver had returned to normal size. There was no change, however, in the size of the enlarged lymphatic glands. By this time the patient felt well, and had an appetite for her food. Constant evening rise of temperature prevailed up to November 7. The pulse averaged 96.

On October 22 a further white cell count was carried out: Polymorphonuclears 40 per cent; lymphocytes 55 per cent; mononuclears 3 per cent; eosinophils 2 per cent. Arneth index 1/0, 2/15, 3/25, 4/44, 5/16.

The Kahn test on the blood was negative. The Lehnendorff's test was positive 1:120 dilution. By this time the patient complained of a sore throat, and several boils appeared on the right arm. Both conditions quickly cleared up. The temperature became normal on November 7; by this time there had been a remittent pyrexia for approximately seven weeks. The enlarged lymphatic glands showed a definite decrease in size,

but up to the time of discharge from hospital on November 19 they were still quite palpable.

On this date the Lehnendorff's test was negative, and the blood-count showed: Total red cells 4,800,000; hæmoglobin 90 per cent; colour-index 0.93; total white cells 8,400; polymorphonuclears 46 per cent; lymphocytes 42 per cent; mononuclears 11 per cent; eosinophils 1 per cent.

The treatment was symptomatic.

The child was seen six weeks after discharge from hospital. She had completely recovered and all the glands had subsided. The white cell count showed a polynucleosis. No other cases occurred in the family, but two further cases are suspected in the Royal Air Force training camp in which the child lived.

I wish to thank Lieutenant-Colonel A. Hood, R.A.M.C., Commanding Military Hospital, Moascar, for permission to send these notes for publication.

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AN UNERUPTED SUPERNUMERARY IMPACTED LEFT UPPER MOLAR.

BY MAJOR G. W. WILL, O.B.E.,

Royal Army Medical Corps.

THIS case is reported as being out of the usual run of cases encountered either by myself, as an alienist, or by medical officers in more intimate touch with men of their units.

The man concerned was seen at the request of the Deputy Judge Advocate General, Southern Command, India, who had the Summary of Evidence for a Court Martial under consideration. The charges included a series of sexual offences.

When seen, on July 28 and 29, 1936, the man frankly admitted the offences. These concerned the sending of grossly indecent letters, literature, and pictures to women. One instance of exhibitionism, although admitted, was not the subject of a charge.

His age was 22. Service was four years; one year and four months in India. His record was good and he had been regarded as above the average in intelligence and efficiency. He appreciated his position, had good insight, and willingly co-operated in his examination.

Family history was negative. Personal history included: (a) Sleep walking as a child; (b) average school performance; (c) hasty temper at work; he left his first job in a garage because he "punched a bloke in the ear"; (d) first regular employment was as a greaser in the Southern Railway; (e) he mentioned "sunstroke" while at the seaside; (f) he said that he was hit on the head by a pendulum coupling while at work, and while still dazed, wandered along the tracks and exposed himself. This led, directly, to his leaving the service of the Railway Company, and indirectly, to his enlistment.

He admitted that he had always been interested in sexual matters, but that recently his mind had, at times, been completely obsessed by sexual thoughts. He thought this might be due to his no longer being able to have regular sexual intercourse. Native women made no appeal to him, and he spoke regretfully of Exeter as compared with Jubbulpore. He associated his obsessional periods with severe headaches, invariably commencing on the left side and always at night.

He described himself as lying in bed until the combination of headache and sexual thoughts became unbearable and he got up and wandered about. Sometimes he remembered what transpired but at other times there was no memory for the events of the night.

He said that he remembered all the things with which he was charged, there were others which were not mentioned, and, probably, still others which he had forgotten.

He said, "I did not do them every time I had a headache but I never did them unless I had a headache."

Physical examination was at first completely negative except that, as is the case with so many men of his age in India, he seemed to have "outgrown his strength." The urine was normal. A blood Wassermann reaction and Kahn test were subsequently negative. When the routine X-ray of the skull was taken it was found that he had an unerupted supernumerary impacted left upper molar. This gave a possible, if not probable, organic cause for his headaches.

I reported to the D.J.A.G. that the man was fit to plead and that the question of his mental state at the time of committing the acts in question could be decided by the Court after hearing medical evidence, but that I considered invaliding preferable to disciplinary action.

The Court Martial proceedings were dropped and the man was transferred to the Mental Section at Colaba.

After further X-rays the third molar was extracted by Captain F. J. McCarthy, Army Dental Corps. This, it was hoped, would allow the supernumerary freedom to erupt.

A fortnight later the patient expressed himself as much improved and free from headaches; so he was transferred to the medical ward where he remained until he was evacuated to England late in December.

During this period his behaviour with the Sisters and Parsi V.A.D.s was in every way normal. He slept well, said he was no longer troubled by sexual thoughts, and expressed himself as very grateful for the treatment which had freed him from headaches.

When posted to Netley in February, 1937, I found him again under my care. He was bright and cheerful appearing in every way normal. He said, "I feel perfectly all right now and have had no more trouble."

An X-ray taken by Lieutenant-Colonel O. J. Blaikie, R.A.M.C., showed: "The supernumerary tooth has moved forwards into the space previously occupied by the roots of 18. It has also descended slightly but is not yet erupted."

The chief moral of this story seems to be, "Never neglect any part of routine examination." I have always been impressed by the "fourteen points" of one of my most esteemed colleagues.

I suggest that here we had an example of a conditioned reflex and that the removal of the stimulus put out of action a series of complicated reflex arcs whose final activities were made manifest in the form of obsessions and fugues. Activity in the conscious levels gave rise to obsessional thoughts while a similar mechanism in the unconscious levels caused fugues. There must have been an underlying tendency for his thoughts to assume a sexual form—the paths most frequently used being the easiest to follow.

Application of the censor would have resulted in psycho-neurotic phenomena as exemplified by the production of anxiety neurosis following the stimulus of such toxins as those of dysentery. (In the consideration of psycho-neurotic cases all too often the practical work of Pavlov on conditioned reflexes is neglected and too great attention paid to Freudian theories which can, at best, be taken as explaining phenomena which have organic causes.)

This case is, further, an example of the interesting co-operation between the Legal and Medical branches of the Service.

My thanks are due to Lieutenant-Colonel W. T. Fletcher, the D.J.A.G., Southern Command, India, who referred the case; to Lieutenant-Colonel A. D. Stirling, D.S.O., R.A.M.C., for his assistance at Jubbulpore; to Assistant Surgeon Heathcote, I.M.D., who took the original X-ray; to Captain F. J. McCarthy, A.D.C.; and to Colonel G. F. Rudkin, D.S.O., for permission to send this case for publication.

Echoes of the Past.

WAR EXPERIENCES OF A TERRITORIAL MEDICAL OFFICER.

BY MAJOR-GENERAL SIR RICHARD LUCE, K.C.M.G., C.B., M.B., F.R.C.S.

(Continued from page 354.)

CHAPTER XXIII.—MALARIA CAMPAIGN.

The other great work for medical administration during the summer of 1918 was the fight against malaria. This fight was entered upon with our eyes fully open. Palestine was well known to be an intensely malarial country. When it became so we do not know. There is little in the Bible to show that the inhabitants in those days suffered from malaria. There are good descriptions of many diseases, both contagious and epidemic, but no hint of the annually recurring, energy sapping one now so universal, which makes some parts of the country almost uninhabitable in the summer and autumn months, and which by its ravages undermines the

constitution and sucks out the energy of those who live in the badly affected parts. We know on the other hand that it was there in Crusading times. Our own King Richard the First obviously suffered from it and there can be little doubt that it played its part in breaking his determination to carry through his enterprise and made him long to get back to the more healthy climate of his own land just as so many of our own men did in the summer of 1918. Exactly when the disease settled there we do not know, but it is certain that its advent must have profoundly influenced the history of the land. Malaria is probably responsible even more than the bad government of the Turks for the impoverishment of the country, for the almost complete extermination or withdrawal of the better class of residents and the very considerable reduction in population that has taken place in the last two thousand years.

The history of the coming and going of malaria in localities is an interesting and difficult subject. Why a country like Mauritius, which was free from malaria until some fifty years ago, suddenly became badly infected, we know not. On the other hand, why the Fen country and the marshes of Essex, formerly malarious, without any definite campaign against the disease, gradually ceased to be so, is equally difficult to understand. Sir Ronald Ross has made a study of this and has endeavoured to reduce the rules under which malaria ebbs and flows to a mathematical formula, but there remains much mystery about the way in which the various factors produce their results.

On entering Palestine in the spring of 1917 the Egyptian Expeditionary Force as a whole had little experience in dealing with malaria. As has already been mentioned a good deal of experience was gained during the summer of that year on the Wadi Ghuzzeh which stood us in good stead in the bigger campaign of 1918. We were fortunate in having good advisers attached to the Force. In Major E. E. Austin, already referred to, of the British Museum, we had one of the best-known living authorities on mosquitoes. His knowledge of the habits of the malaria-carrying varieties and his untiring efforts in hunting them out proved of the most inestimable value to the Force. He was employed as a free lance working over the whole of the occupied area and by his periodic inspections was able to correlate and check the results of the work done to prevent the breeding of anopheles. We had also the benefit of the advice of Major Andrew Balfour (alas! no longer with us), later appointed Director of the London School of Hygiene, whose work on malaria prevention in Khartoum and the Soudan had brought him a world-wide reputation. In the Force itself we had also regular R.A.M.C. officers like Colonel C. P. Fowler, who had had great experience.

The work of malaria prevention has proceeded along several different lines. One method is, taking the mosquito for granted, to endeavour to prevent it conveying the poison to man by protecting him from its bite. Most of the damage is done at night for the anopheles are chiefly night

feeders. By billeting stationary troops in mosquito-proof huts and tents and providing those in the field with mosquito nets and making individuals anoint themselves with various essential oils' deterrent to the mosquito an attempt is made to ward off the enemy. Another method is to dose every individual as a matter of routine with sufficient quinine to prevent the development of the disease in the blood though the germ may have been introduced by the bite of the mosquito. The third method, that of carrying the war into the enemy's country—defence by attack—is to destroy the mosquito himself, or rather *herself*, for it is the lady alone that does the mischief.

There has been much controversy in the past as to which is the best of these methods for the extermination or reduction of the disease. The continental schools for the most part believed in the two former methods. The British Modern school, following Ross, favoured the last; and though the Italians have done much to remove the terrors of malaria in the Campagna of Italy by their methods, the great triumphs of the work have been achieved by the third method—as in Ismailia and Port Said by the Ross brothers, and in Khartoum by Andrew Balfour, and finally in the Panama Isthmus. Gradually, therefore, a consensus of opinion had arisen that this was the right way to tackle the problem.

These results were, however, obtained under peace conditions. War introduces a totally different set of difficulties. It is a comparatively easy business to deal with the individuals of an army, but to undertake the destruction of mosquitoes over a wide area of country almost universally producing them is a big engineering undertaking and one which rather frightens the average commanding officer when it is proposed to him. It is not so many years since one of our greatest generals, Lord Wolseley, wrote:—

“The sanitary officer is the creation of recent years and as a general rule he is a very useless functionary. In the numerous campaigns where I have served with a sanitary officer, I can conscientiously state I have never known him make any useful suggestions, whereas I have known him make many silly ones. It is not his fault, for with an army moving it is impossible to drain a town, as I have known suggested, or carry out any other great sanitary measures. There is not time for any great sanitary works; and for the ordinary cleanliness of temporary camps or bivouacs the P.M.O. with each division can do all that is necessary. In future, as long as this fad continues, my recommendation is to leave him at the base, where he may find some useful occupation as a member of the Sanitary Board, which I think should have charge of all sanitary arrangements at the Base.”

I wonder how Lord Wolseley would have faced the proposition put before General Allenby in Palestine. Fortunately General Allenby was of a more open mind and belonged to a more enlightened age.

The problem confronting him at the beginning of 1918 was this: You

are holding a line across a country which is known to be intensely malarious. Parts of it, for example the Jordan Valley and the plain of Sharon near the sea, are uninhabitable for Europeans during the late summer and autumn. If these areas are held during these periods without very active measures to deal with malaria, your army will be decimated with the disease.

It was a great problem. He decided that he must hold the line, but he did not send his sanitary officers to the Base. He trusted them and gave them a free hand—a great decision and characteristic of the man. Once the decision was made the medical authorities had no cause to complain of the backing they had from the executive. Work on anti-malaria schemes was given priority over all other work behind the lines. It was decided to employ both the first and third methods referred to. Quinine prophylaxis was not employed by compulsion, though units wishing to use it were given facilities to do so. Troops were served out with mosquito nets and huts were made mosquito proof as far as possible. An ointment containing essential oils was served out as a ration to all troops. But chief reliance was placed upon destruction of the mosquito, or rather on the prevention of its breeding. The fertilized mosquito lays her eggs on the surface of any available water where they remain until the larvæ hatch out and swim off. The essential, therefore, is to prevent the mosquito obtaining any access to suitable water.

The methods employed were :—

(1) Reduction of water areas suitable for breeding by drainage of pools and marshes.

(2) The cleansing of all streams of weed and the straightening and smoothing of their banks so as to remove all dead water, in which the mosquito prefers to lay her eggs.

(3) The prevention of their access to wells or other drinking water supplies by sealing them with covers or gauze.

(4) The oiling of all open water which could not be protected otherwise.

As long as there is a film or scum of oil on the surface of the water the mosquito is unable to lay her eggs on it. For this purpose a mixture of equal parts of heavy oil and ordinary paraffin oil was generally used—the former alone is too slow in forming a film and the film of the latter does not last long enough to be used by itself. Very careful surveys were made of the whole area and maps made showing clearly all possible breeding places. It must be remembered that no rain falls in Palestine from the beginning of April to October. The permanent springs and streams are comparatively few so that water has to be stored for use by the inhabitants for the whole of this period. This is done in innumerable wells and cisterns.

The magnitude of this part of the problem will be realized when it is stated that in Jerusalem alone there are many thousands of reservoirs and that every village has a proportionate number. Jerusalem itself we could

not tackle. It was decided in its case that discretion was the better part of valour and that the best method of dealing with it was to keep the troops out of the town. There were, however, large numbers of men in the town at various times and a considerable number of the cases of malaria which did occur, were acquired there during visits for sight-seeing or on duty for necessary purposes such as supply and transport work.

In the plain of Sharon there is only one prominent river, the Auja. It rises suddenly out of the ground by a number of springs about the middle of the plain just behind our front line and runs by a wandering course of about ten miles to the sea. The banks of the river were everywhere overgrown with vegetation which, choking the edges of the stream, produced still water in which *Anopheles* could breed. These banks were cleaned and smoothed off for the whole length of the river, and so rapid was the growth of the vegetation that the whole work had to be done a second time a few months later.

In the plain there were also several fair-sized marshes containing stagnant pools which formed ideal breeding grounds. These marshes were drained away into the Auja by the construction of long dykes.

It must be borne in mind that much of this area was in direct view of the Turks so that the work had to be done under artillery fire from the Turkish lines. So much so that only very small parties could be employed at a time in some places.

The Jordan Valley area contained several permanent streams and much marshy ground, all of which had to be dealt with. Our own 20th Corps area was different. We held the Judæan hills. Here the problem was one of small streams running in deep valleys, interrupted in their course from time to time by disappearing underneath stones. All these were found to be breeding places, and all had to be cleared of weed and trained in their course. We had also many villages, each with its usual quota of wells and tanks, all breeding mosquitoes. The wells were visited and oiled once a fortnight. The work on the streams was continuous, for the level of the water was constantly changing, thereby forming new banks and the edges were constantly being broken down by the trampling of animals and the natural destructiveness of man.

The organization employed in the 20th Corps was as follows :—

Each division was responsible for the work in its own area. The Divisional Sanitary Section was responsible for carrying out all the bigger pieces of work under the direction of the D.A.D.M.S. of the division who acted as Inspector for the area. At the same time each unit was supposed to have a malaria squad, acting under its own regimental medical officer, which undertook minor work in the vicinity of its own unit. The D.A.D.M.S. of the Corps, Major Steadman, kept an eye on the work of the whole Corps, co-ordinating it and by regular and frequent inspections keeping up its standard. The divisions were frequently changing their areas so that his work in maintaining continuity of policy was most

important. Much of the actual manual labour was done by gangs of the Egyptian Labour Corps, placed at the disposal of the O.C. of the Sanitary Section, his own men acting chiefly as foremen. Many of the personnel of the sanitary sections became great experts. They took the keenest interest in the work and acquired a real scientific knowledge of the life and habits of the mosquito.

On a large scale map in my office we kept record of all the places where mosquitoes had been found, and of the work that was being done to destroy them. Those divisions that were slack in their work had to be stimulated. New and successful methods of oiling and of revetting the edges of streams originated by individual workers of one division were passed on to other divisions. As an example of what the work meant I will refer to what was done at Corps Headquarters.

In the immediate neighbourhood of the German Hospice on the Mount of Olives within a radius of about half a mile there were about 50 wells and cisterns. Each of these was visited, examined and oiled, once a fortnight—half one week and the other half the next. If left longer than a fortnight breeding was almost sure to have recommenced and *Anopheles* larvæ would be found. It must be remembered that these wells and reservoirs supplied all the local inhabitants with drinking water. The addition of paraffin does not improve the flavour of the water, in fact, makes it undrinkable for some days. It was found by experiment that the evil taste passes off before the end of the week, so that by oiling alternate wells each week half were usable for drinking at a given time and at the same time breeding was entirely kept in check. Though Jerusalem is a hot-bed of malaria, we, on the Mount of Olives, only three-quarters of a mile away, were free and had practically no cases during the summer.

The reservoirs of the Hospice itself, constructed on scientific lines by our German hosts, were supposed to be mosquito proof. They were all sealed with fine wire netting in a way which appeared to human vision quite secure, but Nature is wonderfully persistent in her effort to secure the survival of the species and the lady mosquito is not easily defeated in her endeavour to find a suitable spot in which to lay her eggs. At any rate, one morning the Corps Commander announced at breakfast that he had found some funny little wriggly things in his bath! Investigation showed that they were larvæ, not fortunately of the true mosquito, but of their nearest relation, the gnat, proving that all the skill of the German scientists had been defeated by the maternal instinct of the insect. However, this was an isolated occurrence, and we saw very few mosquitoes or gnats during the months we spent on the Mount of Olives.

The attention of the medical service was not directed solely to the prevention of malaria. Every endeavour was made to ensure prompt and efficient treatment of the cases as they occurred. It is not easy to diagnose malaria in its initial stages. It does not show the typical temperature

chart which is so diagnostic in the later stages. In its outward symptoms it differs in its milder forms very little from any other febrile disease such as influenza and sandfly fever and in some of its more severe forms is easily mistaken for heat apoplexy, meningitis, and acute dysentery. The only certain means of diagnosis is the discovery of the germ in the blood. On the initiation of Captain Philip Bahr, a son-in-law of Sir Patrick Manson, and himself already a well-known authority on tropical diseases, a system was inaugurated by which the blood of all doubtful cases was tested at once, before they left their units or the field ambulances. A small unit was brought into being called a Malaria Diagnosis Station. It consisted of a medical officer and two men of the R.A.M.C., all specially trained in bacteriological laboratory work. They were equipped with two microscopes and the necessary apparatus for blood examination and a special tent to do their work in. They were also provided with their own transport, consisting of a wagon and pair of mules, so that they could move about to any part of the line where their services were most useful. Slides for the preparation of blood-films were issued to all medical officers so that they could send off specimens of blood of suspected cases and get a report back the same day from the diagnosis station.

The patient was not evacuated from the field ambulance until a report was received so that his treatment with quinine could be commenced if the result proved positive. A card showing the type of organism found and an account of the treatment he had received accompanied each man down the line. There is no doubt that this early diagnosis obtained on the lines by this organization saved many severe lung cases which are so difficult to diagnose by symptoms and which if not treated in the initial stages with heavy doses of quinine are often fatal.

The result of the anti-malaria work was evident. Mosquito breeding in the areas dealt with was greatly reduced, and in many places temporarily stamped out. As the summer went on a good many cases occurred in the Force, but the source of infection could generally be traced to some failure in organization or to the temporary occupation by troops of some area which had not previously come within the sphere of anti-malaria operations.

The worst infection of our divisions occurred when the 60th Division went down into the Jordan Valley to assist Desert Corps in the second raid across the Jordan.

The result of all our efforts was that though there were many cases occurring throughout the Force all through the summer and early autumn, the disease never became an epidemic. The stamina and morale of the general body of the troops was never affected by it, and when the time came for the great advance in October, the general health was good, the units were at good strength, and the hospitals in Egypt and on the lines of Communication were not unduly full.

The proof of the usefulness of the work came after the advance. The

incubation of malaria is about a fortnight. Within a fortnight of the day on which the divisions left their carefully treated lines and passed into that of the Turks which had not been treated at all, the number of malaria cases began to assume a very alarming proportion. Fortunately by that time the Turks were beaten, and a large majority of the infantry could be withdrawn into the old healthy areas, and though the troops used in the pursuit continued to suffer for some weeks, the total numbers infected formed only a comparatively small proportion of the whole force.

(To be continued.)

Current Literature.

CATHCART, E. P., and MURRAY, A. H. F. **A Dietary Survey in Terms of the Actual Food Consumed.** Medical Research Council—Special Report Series, No. 218.

This is the third account of special inquiries made by Professor Cathcart and Mrs. Murray. The two earlier reports were published in 1931 and 1932, dealing with the diet of families at St. Andrews and of families in Reading and Cardiff: these were fully described in Editorials in the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS. In the earlier reports attention was drawn to food consumption in terms of protein, fat and carbohydrates. In the present report the data have been interpreted in terms of the principal foodstuffs purchased by these families.

In the earlier reports there was a marked constancy in the distribution of calories between fat, protein and carbohydrates eaten by people in the different towns. The constancy of the percentage of the protein was remarkable in view of the wide difference in the foodstuffs eaten by the communities, and seems to be the result of a kind of instinct. The purchasers of food were untutored housewives with a varied selection of materials to choose from: the purchases did not remain constant from day to day, nor did the housewives have a similar sum to expend on food, nor did they expend it alike.

As regards mineral requirements of the body, and Sherman's figures of 0.68 g. of calcium, 1.2 to 1.5 g. of phosphorus and 15 mg. of iron per day in a satisfactory diet, all the groups at St. Andrews, with the exception of one, were definitely above the accepted standards. The second investigation made at St. Andrews in the autumn gave identical results as regards protein, calories, etc. The authors then re-stated the results of the investigation in terms of foodstuffs eaten. The man values and expenditure of food per man per week were practically the same at the two periods, and as might be expected, the same types of food were consumed by more or less the same number of families in both periods. Moreover, the general impression was that there is little real difference in the consumption

of food in winter and spring. This result is interesting, as it would have been anticipated that the consumption of food would be greater in the winter than the summer. The explanation seems to be that people normally reduce their energy expenditure in winter by having their houses better heated, or by wearing warmer clothing, or by both means; the need of extra food is thus reduced.

Professor Cathcart and Mrs. Murray took the opportunity of examining the amount of refuse and waste which takes place in the process of cooking and serving meals in ordinary households. The excess amount of food to be purchased in order to allow for refuse and waste is the determining factor in the assessment of *gross* purchases over *net* requirements and is generally stated in calories. At the recent conference on dietary requirements convened by the Health Section of the League of Nations, the basic standard for an average man leading an ordinary day life was taken at 2,400 calories *net*. No *gross* standard was agreed upon owing to the known variations in the amount of refuse and waste which took place in different households, with different dietaries, different age-groups, and groups of different social standing.

The results of Professor Cathcart and Mrs. Murray's investigations were astonishing. They found that the mean percentage loss of edible calories was only 2.7 and 2.6 for the duplicate series. A maximum loss of approximately 6 per cent in a single study and of round about 5 per cent in only four more, speaks volumes for the care exercised by the housewives. They think that the conventional allowance of 10 per cent for refuse and waste far overstates the real position. They suggest that if these families can be taken as fairly representative an allowance of 5 per cent for the loss of edible calories in a mixed diet would allow an ample margin of error.

They conclude that few of the diets examined, when considered from the standpoint of energy, protein, fat, percentage of first-class protein, and mineral salts, can be regarded as really poor. As regards "protective" foodstuffs, such as milk, green vegetables and fruit, many of the diets leave much to be desired.

They lay great stress on the need for educating the average housewife in the relative nutritive value of different foodstuffs by personal contact and by demonstrations in which the cooking utensils used are those which the housewives have at command in their own homes.

WICKSTRÖM, J. *Scarlatinastudier. I. On resultaten av förberedande Dickundersökningar och immuniseringsförsök mot scarlatina i Finlands armé. [Scarlatina Studies. I. Concerning the Results of Preparatory Dick Tests and Immunization Experiments against Scarlatina in the Finnish Army.] Finska Läkäresällskapetets Handlingar. 1936, v. 79, 1029-50. [43 refs.] German summary.*

Scarlatina in the Finnish Army has become an increasingly serious problem, witness the almost uninterrupted ascent of the morbidity curve

since 1928, when there were 179 cases, 7 of which proved fatal. By 1933 this figure had risen to 535, the number of scarlatinal deaths in this year being 14. In 1935 there were 768 cases, with 13 deaths. It was found that the incidence of this disease was highest in the first few months of army service. Altogether 6,783 soldiers were subjected to Dick tests, but only 3,367 satisfied the conditions required for a comparative study. Among them were 2,865 found to be definitely Dick negative (85.1 per cent). There were 95 (2.8 per cent) classed as both plus and minus, and the remainder (12.1 per cent) were in varying degrees Dick-positive. The prognostic importance of the Dick reaction was shown by the fact that the incidence of scarlatina among the Dick-positive men during their army service was 20.4 per cent, whereas the corresponding figure for the Dick-negative soldiers was only 0.34 per cent.

Wickström's investigations with both toxin and anatoxin have given him the impression that they are equally effective in converting a positive into a negative Dick reaction after an interval of two months, but that anatoxin is to be preferred because it is not so likely to provoke a severe general reaction. His investigations with these two preparations concern a total of 131 men. Serologically, it would seem that in some 78 per cent such treatment achieves the desired effects, but clinically speaking it has yet to be proven that real immunity results from this treatment. That it does so is suggested by a comparison of two groups, each of 74 originally Dick-positive soldiers. The 74 who were artificially immunized escaped scarlatina during the remaining ten months of their army service without a single exception, whereas 12 of the controls not immunized developed scarlatina.

C. LILLINGSTON.

Reprinted from "Bulletin of Hygiene," Vol. 12, No. 4.

LIÈVRE-BRIZARD. Etude sur une épidémie de coqueluche traitée par le paraoxybenzoate de méthyl-propyl-diphénol. [**On an Epidemic of Whooping-cough Treated by Methyl-Propyl-Diphenol.**] *Bull. Acad. Méd.* 1936, v. 116, 863-7.

The author who records ten illustrative cases in children aged from 3 to 10 years, during a recent epidemic of whooping-cough, treated about thirty cases by the following method. Every morning and evening the special ward in which the patients were kept was sprayed with an oily solution of methyl-propyl-diphenol paraoxybenzoate. The spraying took place with the patients in bed and the doors and windows closed but not hermetically sealed. As the smell of the drug was not unpleasant or irritating, the children were kept in this atmosphere for half an hour. It was soon found that the frequency and intensity of the paroxysms in the children thus treated rapidly declined, so that the disease was over in a very short time, whereas in controls treated by the ordinary methods the frequency of the paroxysms diminished very slowly, and the general condition suffered as a result of vomiting.

J. D. ROLLESTON.

Reprinted from "Bulletin of Hygiene," Vol. 12, No. 4.

Reviews.

THE MEDICAL ANNUAL, 1937. Editors: H. Letheby Tidy, M.A., M.D.Oxon., F.R.C.P., and A. Rendle Short, M.D., B.S., B.Sc., F.R.C.S. Bristol: John Wright and Sons, Ltd. London: Simpkin Marshall, Ltd. Pp. lxxii + 704. Price 20s. net.

The Medical Annual of 1937 gives an excellent summary of medical activities during 1936.

Macdonald Critchley contributes a series of articles on Neurological subjects. In dealing with migraine he quotes literature regarding the theories of the ætiology of this condition, a question that is still far from settled. He agrees that femergin (ergotamine tartrate), especially when administered hypodermically, is a valuable adjunct in the treatment and possibly to a lesser extent in the prophylaxis of this disease. He discusses the treatment of narcolepsy and mentions the occasional occurrence of nocturnal insomnia when large doses of ephedrine are used or when the last dose is given close to bedtime. Benzedrine sulphate is considered by some workers to be three times more efficacious than ephedrine. The initial dose should be 10 mg. after which it may be increased to 30 mg. three times a day; this sometimes gives complete relief from symptoms.

The article on Nervous Disorders in Boxing or Punch-Drunkenness should be of special interest to pugilists. It is pointed out that there is some parallelism between the degree of facial disfigurement and the intensity of the punch-drunkenness; for this disorder is particularly associated with these pugilists who have been distinguished less for their speed and foot-work than for their capacity to "take it." Differentiation may sometimes be difficult between such cases and cases of disseminated sclerosis and G.P.I.

R. G. Macfarlane writes on Snake Venom in Medicine. He deals with the nature and action of the poison in the *Viperidæ* and the *Colubridæ*. Therapeutically as a local hæmostatic the venom of the *Russell viper* has been found to be particularly active producing a thrombokinase type of coagulant. A solution of 1 : 10,000 can be applied with perfect safety. Sterilization of the venom is ensured by filtration; the sterile solution maintains its potency when evaporated to dryness and kept in ampoules. The injection of a dilute solution of the venom of *Ankistrondon pescavorum* is reported to have given favourable results in cases of "idiopathic" uterine bleeding.

R. St. A. Heathcote discusses new therapeutic remedies. First he deals with the chemotherapy of streptococcal infections by the relatively insoluble preparation prontosil which is given orally and by the soluble preparation prontosil S. used intramuscularly. He considers that these drugs raise our hopes for the successful treatment of this very serious infection to a great height. He next deals with the therapy of angina

pectoris and quotes the work of Hoyle and Evans in which they showed that nitrites and organic nitrates were the best drugs for relieving spasms. Glyceryl trinitrate in doses not exceeding $\frac{1}{30}$ grain was found to be best provided absorption was allowed to occur in the mouth. This drug acts equally well either to relieve spasm once it has occurred or as a prophylactic given immediately before exertion. Coramine or cardiazol are also dealt with. They have been shown to exert their beneficial effects by stimulation of the cerebrum, the respiratory and the vasomotor medullary centre. There is, however, little or no direct action on the cardiovascular system. Novurit, the newest of the mercurial compounds, is put up with theophylline as the addition of this purin derivative makes it a more effective diuretic. Novurit can be employed by the intravenous route or given in the form of a suppository. Like the older preparations it acts more effectively if ammonium chloride is given for twenty-four hours beforehand. Other new preparations described are anahæmin, protamine insulinate, magnesium silicate and benzidine.

Blood transfusion is dealt with by Lambert Rogers. He discusses the continuous drip method of Marriott and Kekurek and describes the use of the blood of cadavers as introduced by Yadin of Moscow.

The literature on burns is reviewed and the opinion is expressed that coagulation remains the local treatment of choice in the majority of cases of burns and scalds, certainly when extensive and severe. In less severe cases cod-liver oil gives good results.

H. Letheby Tidy gives a short summary of the findings of the First International Congress of Gastro-Enterology held in Brussels in August, 1935, when the subject of non-amœbic ulcerative colitis was discussed. The surgery of this condition is dealt with by Rendle Short.

Acute osteomyelitis in childhood is described by E. W. Hey Groves and after a careful survey of results he concludes that early operation gives no assurance of recovery; it is wiser to wait till the second week and then do the minimum necessary for bone drainage.

John Fraser and Reginald Miller review the recent work on undescended testes and special mention is made of treatment by pregnyl, an anterior pituitary substance, a gonadotropic hormone, found in the urine of pregnant women.

A. Tudor Edwards considers amongst other things, the literature on malignant disease of the lung. He shows that the condition is still far too frequently not diagnosed or even suspected until too late in the disease for successful removal to be possible.

Disease of the pericardium, including Pick's disease, is dealt with by A. G. Gibson. He describes the ætiology, differential diagnosis and treatment of constrictive pericarditis and points out the satisfactory results to be obtained from the Delorme operation of pericardial resection when the diagnosis is certain and suitable cases are selected for this treatment.

Ivor S. Davies contributes the article on urinary infections and the

treatment of pyelitis. In considering mandelic acid and its salts he points out the type of case suitable for this form of treatment. He considers ammonium mandelate to be as efficient as the sodium salt, with the advantage of enabling one to obtain the necessary pH reaction without the addition of the unpleasant ammonium chloride. This article is followed by a consideration of urinary antiseptics by Hamilton Bailey.

Recent advances in ear affections are dealt with by F. W. Watkyn-Thomas. He points out that benzylmethyl carbinamine (benzedrine) has a powerful effect in causing shrinkage and relief of congestion of the nasal passage without any subsequent paralytic dilatation leading to congestion. This drug has been found of value in eustachian catarrh.

Blomfield contributes articles on anaesthesia. He considers that pentothal, the new barbituric for intravenous injection, promises to oust evipan which it resembles in action and rapidity of detoxication. It should be used without other sedatives or narcotics, but may conveniently be followed by other anaesthetics when used for operations longer than half an hour. Recovery is rapid and comfortable, vomiting being almost invariably absent.

There is an interesting section on radiology by J. F. Brailsford, in which many aspects of this special branch are discussed. The use of pitressin (10 pressor units) in cases where large collections of gas in the colon are troublesome, interfering with gall-bladder and renal pictures, is mentioned. Effective results were obtained in 82 per cent of cases after these injections. It is considered inadvisable to use this preparation in patients having a systolic blood-pressure below 100 mm. of mercury or in patients who have advanced hypertension or suspected coronary disease.

The gastroscope is described by A. Rendle Short. He says it may be that the time is coming when it will be looked upon with the same respect as the cystoscope. In a favourable case almost the whole stomach can be seen, including the pylorus. With experience one can see ulcers and distinguish them from carcinoma. Gastritis can also be recognized. Coloured pictures illustrating the appearance in the normal stomach and in an organ with an untreated atrophic chronic peptic ulcer are shown.

This volume is packed full of valuable information and should be studied in detail by everyone who wishes to keep abreast of recent advances in medicine.

A. G. B.

KATHERINE LYNTON'S PORTRAIT. By F. G. Hurrell. London: John Long, Ltd. 1936. Pp. 287. Price 7s. 6d.

Mr. Hurrell has drawn his portrait with accuracy and imagination though with a certain amount of exaggeration. This is inevitable in the description of a "type," and this book is in effect an indictment of those women who, while working in the world of men, yet retain the feminine instinct of being vitally essential to whatever they are doing. They are incapable of keeping their own lives separate from their job which becomes

eventually to them a matter of life and death. Fortunately for the world of women workers this type is fairly rare, but undoubtedly the danger is there, and Mr. Hurrell has exposed the danger, and incidentally the supreme foolishness of it in Katherine Lynton's Portrait.

There can be no doubt that Katherine Lynton was an exceptionally foolish woman, and as such excites no sympathy from the reader. But perhaps Mr. Hurrell decided this precise effect.

In Paris, where the book starts, Katherine, earning her living as a secretary, becomes the comparatively innocent cause of an extremely nasty suicide. We next find her in England acting as secretary-companion to an old lady, head of a large family, with a shrewish elder daughter. Katherine's Paris episode finds her out and she flies from the house rather than protest her innocence. She becomes private secretary to the head of a city firm; he comes a disastrous financial crash and decamps to Paris. Katherine, full of impassioned loyalty, goes with him, lands herself in a slightly invidious position and the man eventually drowns himself. Katherine decides to devote herself to her younger sister and carries her possessiveness to such extremes that the girl goes off with a man she has fallen in love with but who doesn't propose to marry her. Katherine marries a scientific farmer and decides that his laboratory is of more vital concern to him than she is. A child would have restored her sense of proportion, but he doesn't want children. He eventually goes blind and Katherine is the cause of his blindness. Loving him desperately she runs away to France and the book ends with her death just as her blind husband is arriving to find her.

The book is easily written with a certain dramatic sense, and is an accurately detailed portrait of a woman hungry to be vitally essential to someone or something, and who has no conception of the finer meaning of the word service.

ELEMENTS OF ORTHOPÆDIC SURGERY. By N. Ross Smith, M.B., Ch.M.Sydney, F.R.C.S.Eng. Bristol: John Wright and Sons. 1937. Pp. ix + 246. Price 10s. 6d.

This is a rather remarkable little book. In the space of 246 pages, which also contain nearly one hundred illustrations, the author has compressed much useful information. He not only deals with the usual orthopædic subjects but includes chapters on nervous diseases, fractures and bone tumours.

Apart from a few slips, such as saying that abduction of the hip causes apparent shortening of the leg, there is little to cavil at, and much to praise.

Though the subjects are dealt with briefly, the descriptions are clear and the forms of treatment recommended are sound and up to date.

The illustrations including the X-ray photographs, are well reproduced and helpful.

This does not set out to be a book of reference; but for anyone who wishes to get a rapid grasp of the essentials of the subject for an examination or to rub up his knowledge of orthopædics, the book can be strongly recommended.

C. M. F.

A MANUAL OF RADIOLOGICAL DIAGNOSIS. By Ivan C. C. Tchaperoff, M.A., M.D., D.M.R.E.Camb. Cambridge: W. Heffer and Sons, Ltd. 1937. Pp. 256. Price 21s.

This book as the author states presents a synopsis of the essentials of radiological diagnosis. The illustrations are excellent, being clear, and demonstrate together with normalities many of the chief pathological conditions met with in an X-ray department.

It is a book in which X-ray diagnosis is presented in an original and welcome form, and can be recommended to medical practitioners and students as a valuable aid to film interpretation.

Notice.

"WELLCOME" BRAND WHOOPING-COUGH VACCINE.

WE have received the following notes from Messrs. Burroughs Wellcome and Co.

In response to many requests Burroughs Wellcome and Co. are issuing whooping-cough vaccine. It should be mentioned, however, that there is no satisfactory laboratory test for potency, nor does the clinical evidence yet provide complete proof that all batches of the vaccine made in different parts of the world are effective in *prophylaxis*, but as whooping-cough is often so serious any promising prophylactic measure is worthy of trial. There is no general agreement that the vaccine is effective in the *treatment* of whooping-cough.

"Wellcome" Brand Whooping-Cough Vaccine is prepared at the Wellcome Physiological Research Laboratories from recent strains of *H. pertussis* (the Bordet-Gengou bacillus), isolated by the cough-plate method, and in the smooth virulent phase 1, described by Leslie and Gardner, 1931, *Journal of Hygiene*, xxxi, 423. Cultures are grown on the Bordet-Gengou medium and killed by antiseptic constitute the vaccine.

As regards prophylaxis, in a recent paper Gardner, 1936, *Proceedings of the Royal Society of Medicine*, 29 (Section of Epidemiology (1)), stated that "the evidence that has accumulated justifies the provisional belief that prophylactic vaccination is effective both in reducing the chances of attack and in attenuating the disease in those attacked." It is, of course, desirable that "further statistics of really evidential value should be obtained." Since whooping-cough is most serious during the early years

of life, it is advisable to immunize during infancy, preferably between the seventh and tenth months. It has been suggested by Sauer that a period of several months should elapse before the resulting immunity is complete, but other observers believe that a useful degree of immunity may be obtained in a much shorter period. Authorities differ as regards dosage. Madsen, for instance, recommends a total volume of 2.2 cubic centimetres of a 10,000 million suspension, while Sauer recommends at least 8 cubic centimetres and preferably 10 cubic centimetres for all children over 3 years of age. The interval between injections recommended by Madsen is three to four days and by Sauer one week. Kendrick and Elderling, 1936, *American Journal of Public Health*, **26**, 8, employed the following dosage :—

Dose No.	Subcutaneous injection at site of	Quantity	
		Right c.c.	Left c.c.
1	Biceps	—	1.0
2	Triceps	1.5	—
3	Triceps	—	1.5
4 and 5	Deltoid	1.5	1.5

= 7.0 c.c. (equivalent to 70 thousand million organisms)

Although it entails five injections, this is less tedious than some of the courses which have been recommended.

The injection may conveniently be given at intervals of one week. Reactions appear to be somewhat more troublesome than in anti-diphtheria immunization, especially in older children.

If the vaccine is adopted for treatment, injection should be begun as early in the disease as possible. Once the characteristic whoop has become established, little or no benefit from a course of vaccine can be expected. Some clinicians recommend six subcutaneous injections, each ranging from 100 million to 1,000 million organisms, administered on alternate days. Others suggest 1,000 million to 3,000 million for older children, increasing to 5,000 million or more organisms in six injections; smaller doses are stated by these workers to be less effective.

"Wellcome" Brand Whooping-Cough Vaccine is issued in containers of 10 cubic centimetres, 10,000 million organisms in each cubic centimetre.



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C.L. = Current Literature.

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EDITED BY

COLONEL SIR WILLIAM H. HORROCKS, K.C.M.G., C.B.

ASSISTANT EDITOR :

LIEUTENANT-COLONEL D. T. RICHARDSON, M.C., R.A.M.C.

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Original Communications.

ANTIMALARIA REPORT UPON THE PROPOSED
CANTONMENT SITE AT KAU LUNG TSAI.¹

By MAJOR M. R. BURKE,
Royal Army Medical Corps.

A.—INTRODUCTION.

A MALARIA survey of the area was commenced in March, 1935, and has since been carried out in detail.

The black line in the map indicates a distance of half a mile from the boundaries of the new cantonment site, as originally proposed, and encloses the area which the Government Malariologist had considered necessary to be dealt with in order to obtain efficient malaria control.

The dotted line indicates a distance of half a mile from the boundaries, marked in black, of the new cantonment site, as now proposed.

The malaria survey has been extended to include fresh ground, lying between the black and dotted lines and outside the limits of the survey as originally proposed. In addition, other territory thought desirable of investigation has also been covered.

The work carried out during the course of the survey included :—

- (1) A study of the topographical features of the area.
- (2) Larval survey of the area within half a mile of the limits of the

¹ The Report is Crown Copyright and the extracts are published with the permission of the Controller H.M. Stationery Office.

2 *Antimalaria Report upon Proposed Site at Kau Lung Tsai*

proposed new cantonment site, and outside such boundaries when considered necessary.

(3) Collection, identification and dissection for the presence of malaria parasites in adult anophelines from the area half a mile outside the boundaries and additional areas when desirable.

(4) Preparation of spot maps, records and the taking of photographs.

(5) Investigation of the situation with regard to the existing Chinese population living in the area.

(6) Investigation of special factors influencing mosquito breeding.

(7) Investigation of resting and feeding habits of adult mosquitoes.

(8) Liaison with the Government Malariologist.

(9) Miscellaneous investigations.

B.—TOPOGRAPHY OF THE AREA.

The area under survey has been fairly thoroughly traversed on foot and a careful study made of the nature of the ground, the extent and character of cultivated tracts and the location and type of human habitations and animal shelters present.

The topographical features of the area are broadly speaking as follows:—

To the north of the area a massive chain of hills runs from east to west, the highest point being Lion Rock with an altitude of 1,618 feet.

A series of spurs runs down, north and south respectively, from the main chain, which forms the principal watershed of the area.

The hill streams rise on either side of the main watershed and flow down to the sea, first through the valleys between the spurs and then through the plains below.

The streams flowing through the area fall into a series of groups, according to their natural drainage areas.

A very important natural feature is the subsidiary watershed which, commencing south of $\Delta 1,152$, runs roughly in a south-easterly direction towards the old walled city of Kowloon—a track, outlined on the map by a line of long wide dots, follows approximately the line of the ridge.

The streams rising to the east of this ridge flow into the sea in the vicinity of Kai Tak on the eastern side of the Kowloon peninsula, whilst those rising to the west of this ridge flow into the sea in the vicinity of Shamshuipo and Tai Tok Tsui on the western side of the Kowloon peninsula.

Area under Survey West of the Subsidiary Watershed.

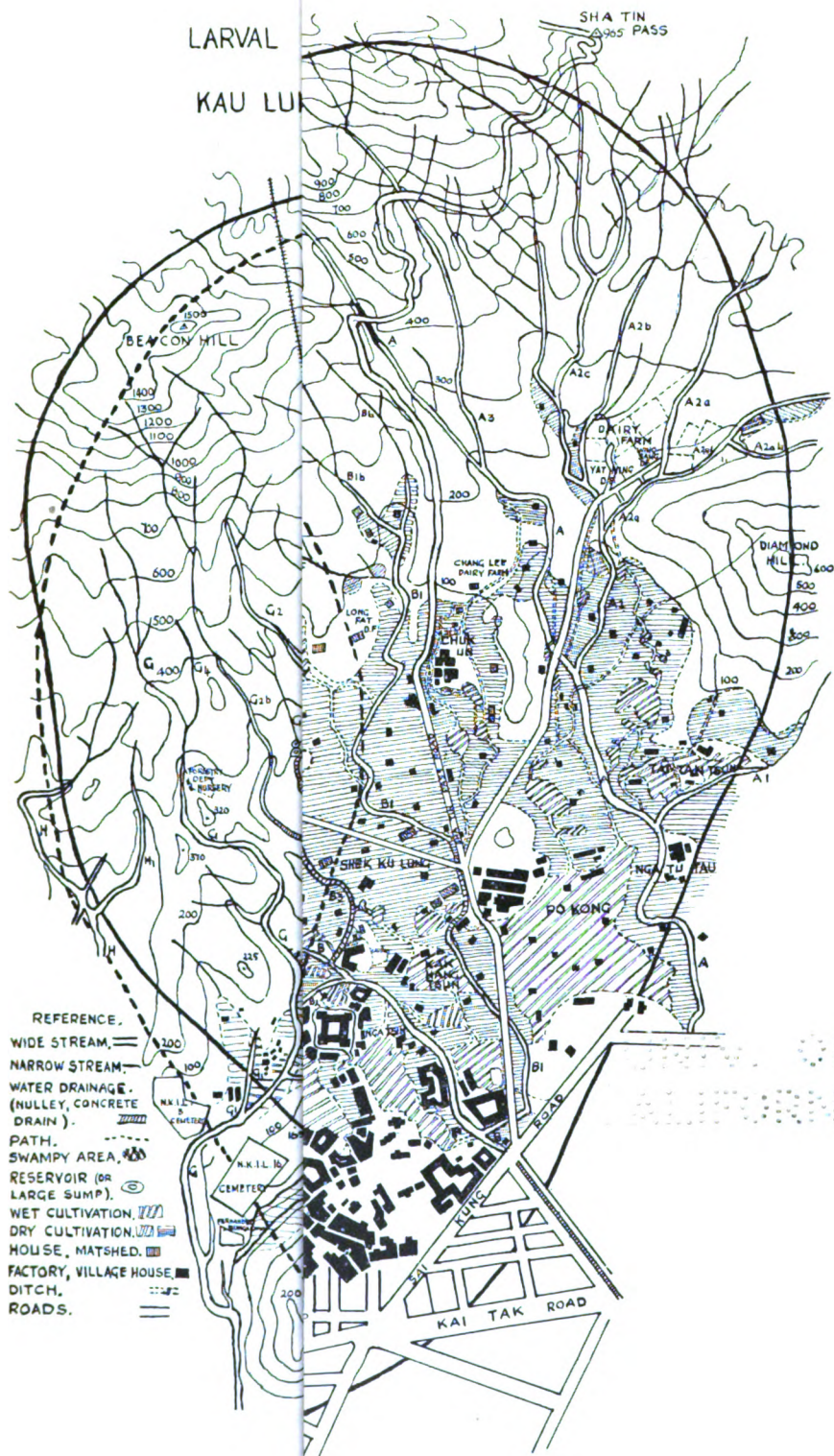
This area is characterized by a series of long spurs, with narrow valleys between them, running roughly in a southerly direction from the main chain of hills.

The spurs are on the whole fairly close together, the valleys between them are deep, whilst the gradients of the hill streams are on the whole steeper than those of the hill streams rising to the east of the subsidiary watershed.

LARVAL

KAU LUN

SHA TIN
PASS



2 *Antimalaria Report upon Proposed Site at Kau Lung Tsai*

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(3) Collection, identification and dissection for the presence of malaria parasites in adult anophelines from the area half a mile outside the boundaries and additional areas when desirable.

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Area under Survey West of the Subsidiary Watershed.

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The spurs are on the whole fairly close together, the valleys between them are deep, whilst the gradients of the hill streams are on the whole steeper than those of the hill streams rising to the east of the subsidiary watershed.

The northern half of this area is heavily afforested, mainly with pine trees, and there are several forest nurseries and experimental gardens maintained by the Colonial Government in this locality.

With the exception of the district west of the Kowloon Tong Estate there are few native habitations and cultivated tracts in this area.

Area under Survey East of the Subsidiary Watershed.

The country here is much more open in character—the ridges running south from the main chain are much shorter and are situated further apart—the valleys between them are in consequence shallow and wide, whilst the gradients of the hill streams, after their initial steep descent, are much flatter and several swamps have been located. The valleys run into an open, low-lying, plain of considerable extent. The area is on the whole sparsely wooded, but on the other hand there are large tracts of land under cultivation, wet and dry, particularly on the eastern flank. This flank has a dense native population mainly engaged in agriculture and many of whom live in primitive and insanitary habitations.

The topographical features of the country north of the high ridges running from Beacon Hill on the west to Grasscutters' Pass on the east have also been studied.

The northerly slopes of the main chain are on the whole more gradual and the valleys between the spurs fairly open. With the exception of a few dwellings and cultivated tracts in the vicinity of Shatin Pass the northerly slopes are uninhabited and form part of a natural catchment area. There is a considerable native population in the plains below, which are heavily cultivated.

A typical stream, after its initial steep descent, flows with a varying gradient through a valley between the spurs running out from the main chain; more or less level stretches, interrupted at intervals by abrupt falls, occur until the stream reaches the plain below where the flat gradient continues until it reaches the sea.

These streams are usually strewn with boulders for the greater part of their courses, and their beds, until they reach the plains, are usually composed of rocks and sand, but not infrequently the water flows over solid rock for some distance.

To the west of the subsidiary watershed, referred to above, the sides of the valleys are well covered with shrubs and trees but the shade afforded is often insufficient to prevent the sun's rays reaching the water, except in some places, where the valleys are narrow and have high steep sides.

To the east of the subsidiary watershed the valleys are much more open, their sides are on the whole sparsely wooded, and shaded streams are uncommon.

The boulders in the streams vary considerably in number, size and shape; some of the larger boulders are fifteen to twenty feet in height and about the same in width.

4 Antimalaria Report upon Proposed Site at Kau Lung Tsai

C.—THE ANOPHELINE MOSQUITOES OF KAU LUNG TSAI AND ITS ENVIRONS.

A survey of known and potential breeding places has been carried out to determine the species of anophelines present in the area, their breeding habits and the nature of their breeding places.

Special attention has been paid to the location and to the type of breeding places of those species of anophelines which are known to be the most important carriers of malaria in the Colony.

Whilst it has been found impossible to repeat in detail surveys of all breeding places detected, nevertheless the more important localities have been searched monthly, so far as was practicable, as the species of anopheline larvæ present in any one area vary widely from time to time.

A total of 77,411 anopheline larvæ was collected and identified microscopically, and a total of 3,536 anopheline adults was hatched out from large larvæ and pupæ, and their species determined during the period March 26, 1935, to June 30, 1936.

Larvæ and pupæ of the following species of anophelines have been encountered: *A. aitkenii* var. *bengalensis*, Puri; *A. hyrcanus* var. *sinensis*, Wied; *A. tessellatus* Theo; *A. fluviatilis* James; *A. minimus* Theo; *A. jeyporiensis* var. *candidiensis*, Koidzumi; *A. maculatus* Theo; *A. karwari* James; *A. splendidus* Koidzumi.

The collection of adult mosquitoes during the course of the survey has been mainly confined to selected "key points," situated in or near that portion of the area on which building is most likely to take place.

Routine catching of adults, morning and evening, has only been carried out since August, 1935, although some collecting was done in May and July, 1935.

During the period May, 1935, to June 30, 1936, inclusive, 580 adult anophelines were collected and identified; of these 444 adult females were dissected for presence of malaria parasites, but none was found to be infected. The factors which have contributed to the total absence of infection amongst adults dissected are considered to be as follows:—

(1) Catching has been mainly confined to the area referred to above; this area, with the exception of "D" valleys, contains few native huts, mat-sheds, etc.

(2) Dangerous breeding places, which formerly accounted for a high incidence of malaria in the Kowloon Tong estate, have been eliminated, and streams trained, whilst a good deal of reclamation has been carried out, both east and west, of the residential area.

(3) There are many native huts in the "D" valleys, but the Chinese living in this locality also keep a large number of pigs and water buffaloes which possibly afford some protection, due to the mosquitoes feeding on them.

(4) Chinese living in the Lion Head Farm area (situated north of Kowloon Tong), which has been considerably developed as regards cultivation since the commencement of the survey, state that they have not

had any attacks of malaria and that they use nets. Extension of cultivated tracts is still proceeding in this area, which has developed into a potentially dangerous one from the malaria point of view for reasons stated later on in this report, and it is considered that it is only a question of time, when a carrier will be introduced to render this area malarial, if it remains as it is at present.

The species of adult anophelines caught include those found in the larval survey, with the exception of *A. aithenii* and the addition of *A. vagus* Dönitz.

All known species of anophelines encountered so far in the Colony have been met with in the area under survey.

The following species of anophelines have been found infected with malaria in the Colony: *A. minimus*, *A. jeyporiensis*, *A. maculatus*, *A. hyrcanus*, *A. splendidus*, *A. tessellatus*. The chief carriers of malaria in the Colony are *A. minimus* and *A. jeyporiensis*.

A. maculatus and *A. hyrcanus* do not appear to be carriers as a general rule, but under certain circumstances they do become infected in fairly appreciable numbers and must, in consequence, be taken into account.

A. maculatus has only been found infected in the Colony at Shing Mun (in the New Territories) and at Wo Li Hop, a village about half a mile distant.

There have been on an average some 2,000 coolies, employed in the construction of a new dam, residing in the lines at Shing Mun, and some of them have lived from time to time at Wo Li Hop.

A. hyrcanus has only been found infected in the Colony at Shing Mun and at Little Hong Kong (a Chinese village on the island).

A. splendidus has only been found infected twice—on both occasions at Shing Mun.

A. tessellatus, a species which is normally but rarely encountered in the Colony, has only been found infected at Little Hong Kong.

A. minimus and *A. jeyporiensis* are the primary carriers at Shing Mun, Wo Li Hop, and Little Hong Kong and it is considered that *A. maculatus* and *A. hyrcanus* have become secondary carriers, due to the incidence of malaria in these districts. *A. splendidus* and *A. tessellatus* have probably become infected for the same reason, but the adults are only occasionally caught, and the numbers found infected are so small, that it is not considered that these two species are of any importance as carriers of malaria.

The percentage infection rates of anophelines caught at Shing Mun, Wo Li Hop, and Little Hong Kong for the years 1933, 1934 and 1935 are quoted here by courtesy of the Government Malariologist as an illustration of the relative importance of the various species of anophelines encountered in the Colony.

[N.B.—It should be noted that the antimalaria measures carried out at Shing Mun and vicinity are mainly of a temporary nature.]

6 Antimalaria Report upon Proposed Site at Kau Lung Tsai

RESULT OF DISSECTIONS FOR MALARIA INFECTION OF ANOPHELES CAUGHT IN
(a) WONG CHOK HANG.

Species	Number of dissections			Number with infected glands only			Number with infected midgut only			Number with infected glands and midgut			Per cent infected		
	1933	1934	1935	1933	1934	1935	1933	1934	1935	1933	1934	1935	1933	1934	1935
<i>A. minimus</i>	3,359	1,980	3,507	54	18	47	96	24	72	28	4	22	5.50	2.32	4.01
<i>A. jeyporiensis</i>	137	56	66	1			2					1	2.18		1.52
<i>A. maculatus</i>	129	91	16												
<i>A. hyrcanus</i>	58	30	30					1						3.33	
<i>A. tessellatus</i>			4						1						25.00

(b) SHING MUN.

<i>A. minimus</i>	2,155	775	1,159	64	7	13	153	14	24	52	2	1	12.48	2.97	3.28
<i>A. jeyporiensis</i>	10,936	4,166	2,646	218	52	14	717	83	39	151	14	9	9.93	3.58	2.31
<i>A. maculatus</i>	230	900	819		2	2	8	8	4			1	3.48	1.11	0.85
<i>A. hyrcanus</i>	2,818	5,245	4,012	7		3	27	14	10			3	1.21	0.27	0.40
<i>A. splendens</i>	25	48	35					2						4.17	
<i>A. karwari</i>	1	4	24												

(c) Wo Li Hor.

<i>A. minimus</i>	1,185	465	86	13	3		18	3		12	3		3.63	1.94	
<i>A. jeyporiensis</i>	3,707	991	69	29	2	2	80	10	1	10	5		3.21	1.72	4.35
<i>A. maculatus</i>	187	476	85					3						0.63	
<i>A. hyrcanus</i>	176	127	39												
<i>A. splendens</i>	4	5													

A. minimus.—Larvæ of this species have been collected chiefly from pools in those portions of boulder-strewn hill streams where the gradient flattens out; such pools are usually either rocky with a sandy bottom, or else pockets in the sandy bed of the same stream courses. These pools are often fringed with grass, normally contain vegetation, and are almost invariably open to the sunlight.

This species also occurs fairly commonly in irrigation ditches, especially those arising from and close to hill streams.

A. minimus breeds most abundantly in the flat stretches of hill streams nearest to the foothills, and has been but very rarely encountered, and then only in exceedingly small numbers in any part where the gradient is steep.

These larvæ have also been met with in foothill seepages, pools left at the sides of streams after heavy rains, a disused concrete washing place, amongst grass and weeds fringing streams, which were not boulder strewn but which were open to sunlight, and occasionally in swampy areas and flooded abandoned paddy fields. Larvæ were rarely obtained from pools, etc., devoid of vegetation of some kind or other.

Larvæ of this species were also encountered in large numbers in November, 1935, in isolated pools in the sandy bed of a flat stretch of a hill stream. This portion of the stream passes through a highly populous area, and by a large dairy farm. It was used extensively as an open-air latrine and as a rubbish dump, and was quite dry except for the isolated pools, mentioned above, fed by seepage.

The degree of pollution in these practically stagnant pools must have been very considerable, and the presence of *A. minimus* larvæ in such large numbers was, under the circumstances, quite unexpected, as this species usually favours clear, unpolluted water for breeding.

Larvæ of this species were met with throughout the period of the survey except in the month of August, 1935. They breed most abundantly in the boulder-strewn streams after the cessation of the rains, when the flow of water eases up and the volume diminishes. They are scarce during the rainy season, when the streams are in spate, and do not appear to be able to stand up to swift currents like *A. maculatus*.

They have been found to be most plentiful in the "A" and "B" series of streams. All these streams flow towards, and the main streams through, areas heavily populated by Chinese, many of whom live in most primitive dwellings.

The Lion Head Farm area (situated north of Kowloon Tong) became, after October, 1935, an abundant source of *A. minimus* larvæ. This was due to certain developments in this locality which will be referred to in detail later in the report.

A. minimus has been the commonest species of anophelines encountered in carrying out adult catching in human habitations in the area under survey.

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Adults have been fairly readily captured from certain types of native dwellings such as mat-sheds. These structures usually consist of a bamboo framework with sides and top composed of palm leaves, old sheets of corrugated iron or sheeting derived from petrol tins, biscuit tins, etc. Occasionally they are roofed with tiles.

These habitations are of a primitive type and are usually dark and badly ventilated. It has been found difficult to capture *A. minimus* from Chinese dwellings built of stone or brick and roofed with tiles, as these buildings are lighter and better ventilated, although of a poor hygienic standard.

This species has only been occasionally obtained from animal shelters in the area under survey. All adults caught have been collected from human habitations and animal shelters close to *A. minimus* breeding places, whilst the bulk of the captures made were after the cessation of the rains—(cf. larval findings).

Evidence collected by the Government Malariologist, elsewhere in the Colony, shows that adults of this species are difficult to obtain from houses inhabited by Europeans and better class Chinese, although they can be readily captured in native dwellings of the mat-shed type, and that dwellings situated closest to the breeding places receive most attention from them.

This species is a most dangerous carrier of malaria in the Colony and has also been found naturally infected with filaria. It has been experimentally infected with subtertian malaria and microfilaria (*W. bancrofti*) by the Malaria Bureau.

Experience in the Colony has shown that the nearer human habitations are to the foothills the greater the danger of contracting malaria. The malaria incidence in these localities has been shown to be due in the main to their proximity to dangerous anopheline breeding places, such as the flat portions of boulder strewn hill streams, swamps and paddy fields.

The history of the Kowloon Tong Estate (Kau Lung Tong) is cited here as a typical example of the association between the presence of important *A. minimus* breeding places and a high malarial incidence.

This estate was developed as a "garden city," and the houses built were all of the European type. The area on which building took place was largely reclaimed land, but, apart from the drainage of the estate itself, little else was done in the way of training hill streams in the vicinity until some years had elapsed.

Occupation of the northern half of the estate was commenced in 1925, and of the southern half in 1926. The residential population was made up of Europeans, Portuguese and Chinese—the Chinese being in the majority in the southern half.

By 1931 the malaria situation had become so intense that a report was submitted, on behalf of the residents of the estate, to the Hon. Director of Medical and Sanitary Services of the Colony.

The report stated that at this time there were 242 houses on the estate of which 232 were occupied, and the total population was estimated to be

1,856. Householders had been asked to send in returns of all cases of malaria occurring in their homes in the previous year (1930). Replies received covered 52 houses and from 29 of these 108 cases of malaria were reported; the incidence being highest in the upper section of the estate where practically every household had been affected. It was also stated that there had been a large number of cases in the households from which returns had not been received and amongst servants who had left for the country.

Later on a private practitioner reported that in November and December, 1932, he had treated eleven cases of malaria in Kent Road (see the map) ten of which were diagnosed microscopically. He stated that he believed the whole of Kent Road to be highly infected and that almost everyone was taking quinine and plasmoquine.

In 1931 and 1932 the Government Malariologist carried out a malaria survey of Kowloon Tong and its vicinity and found that important *A. minimus* breeding places existed in flat portions of hill streams, and certain irrigation ditches, in close proximity to the estate—especially in the neighbourhood of the northern half. The chief breeding places were located in the streams: E (now obliterated by reclamation), F, F1, G2 and its tributaries, and the irrigation ditches of an experimental garden. The worst breeding places were found to be stream G2 and its tributaries.

He found that malaria infections were common in that part of Kowloon Tong nearest to the foothills (from Cornwall Street to York Road, especially in Kent Road) whilst there was no strong evidence of the occurrence of malaria in the remaining part of the estate.

He based his opinion as to the malaria incidence from the evidence furnished by blood and spleen examinations, hospital admissions and inquiries.

The Government Malariologist made exhaustive recommendations, and considerable antimalaria drainage work (of a permanent nature) and reclamations have now been carried out by the Colonial Government chiefly to the west, north-west and east of Kowloon Tong.

As a result of this permanent work malaria has to-day been practically wiped out in Kowloon Tong.

Malaria is not a notifiable disease in the Colony, consequently it is difficult to estimate its incidence from statistics available, but the following information gives a *relative* indication of the progress made in abolishing the scourge at Kowloon Tong.

Admissions for Malaria to Kowloon Hospital (a Government civil hospital) from Kowloon Tong.

- 1932 12 admissions from Kent and Somerset Roads (this total does not include 11 cases from Kent Road referred to above and treated by a private practitioner).
- 1933 19 admissions from Kent, Devon, Norfolk, Suffolk and York Roads and Essex Crescent. Bulk of cases came from Kent Road.
- 1934 2 admissions from Kent Road and Boundary Street.

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1935 4 admissions from Waterloo Road. All these cases came from that portion of Waterloo Road which lies opposite to the mouth of "D" valley. (It is considered that these cases were probably the result of reclamation partially carried out during the year, which interfered with the natural drainage of the "D" valley, and resulted in the formation of important *A. jeyporiensis* breeding places).
1 admission from Kent Road.

A. jeyporiensis—Larvæ of this species have been found chiefly in localities where water is flowing slowly through grass, especially in flooded abandoned paddy fields and swamps.

They have also been met with in the flat portions of hill streams, but only in small numbers, except under certain circumstances. After a prolonged period of dry weather the flow in the streams is considerably diminished and the Chinese construct temporary dams to conserve the supply of water for agricultural purposes—as a result of these measures the flow of water becomes extremely sluggish, the edges of the stream become heavily fringed with grass, etc., whilst in some instances the stream bed itself becomes overgrown with grass and weeds. Thus, conditions extremely suitable for *A. jeyporiensis* breeding arise—marked increase in breeding of this species does in fact take place in these situations, and was especially observed to occur in the first quarter of 1936.

Larvæ of *A. jeyporiensis* are usually only found in small numbers in tracts of wet cultivation, apart from paddy, but in the last quarter of 1935 large numbers were obtained from the following types of wet cultivation: *Pistia stratiotes* (water lettuce). *Eichornia speciosa* (water hyacinth). *Convolvulus septans* (water spinach).

These plants are frequently grown together in the same plot of wet cultivation.

Watercress beds have also been diligently searched throughout the survey but no larvæ of *A. jeyporiensis* have ever been collected from them. Species of watercress grown in the Colony is *Nasturtium officinalis*.

It is interesting to note that the Government Malariologist has found that although *A. jeyporiensis* larvæ can be collected throughout the year in flooded abandoned or fallow paddy fields, in the last quarter of the year they can be obtained from rice cultivation itself and in pools amongst rice stubble. Those found in the rice stubble were probably there before the rice was cut, as few were found in surveys carried out some weeks afterwards.

Larvæ of this species have also been found occasionally in irrigation ditches fringed with grass, grassy seepages and fallow plots of wet cultivation.

This species has been found to breed most abundantly in the area under survey from August to December.

There are a number of abandoned paddy fields in the area surveyed, but no tracts of actual rice cultivation have been observed.

The chief breeding places met with were: Flooded abandoned paddy

fields, tracts of wet cultivation and swamps fed by streams B3a, B3al, B5; swampy area through which stream B7 flows; swampy area through which stream B3b flows.

It should be noted that in November, 1928, two hundred troops were in camp at Chuk-Un which is fairly close to the breeding places referred to above. There were seventy-three cases of malaria within a month and the camp was closed down.

This species next to *A. minimus* has been the one most frequently met with in carrying out catching of adults in human habitations in the area under survey.

With one exception all the adults captured from human habitations have been collected from the mat-shed type of dwelling, whilst none has been obtained from animal shelters.

Unlike *A. minimus* a fair proportion of the *A. jeyporiensis* adults captured have been obtained from human habitations remote from known breeding places of this species. It is interesting to note that at Shing Mun the range of flight of the adult female has been suspected to be a mile and a half. The bulk of the adults captured were collected in the last quarter of the year when the breeding of this species was found to be at its height.

Evidence collected by the Government Malariologist shows that *A. jeyporiensis* adults can be obtained without difficulty from the mat-shed type of human habitations within flying distances of the breeding places of this species.

A. jeyporiensis is a dangerous carrier of malaria in the Colony and has been found naturally infected with filaria. It has been experimentally infected with subtertian malaria by the Malaria Bureau.

A. maculatus.—Larvæ of this species were the commonest met with in the area under survey, and have been encountered over the greater part of the area.

A. maculatus breeds abundantly throughout the year, mainly in the hill streams, and has been found to breed as high up as 750 feet.

After heavy rains, when the hill streams are swollen and the flow of water is fairly fast, larvæ of this species can be collected without much difficulty from the flat portions of such streams, although larvæ of other species are only occasionally met with and then in exceedingly small numbers under these circumstances. This is due to the fact that larvæ of *A. maculatus* possess well-defined caudal hooks which enable them to hang on to projecting vegetation or marginal irregularities of pools, etc., whilst larvæ of other species are washed away.

A. maculatus is ubiquitous and has been obtained from every type of breeding place encountered in the area under survey. It has been found chiefly in rocky or sandy pools, usually open but sometimes shaded, and normally with vegetation in the hill streams. Although commonest in the flat stretches it has also been met with in those portions of hill streams where the gradient is steep. It is also commonly encountered along the

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grassy edges of streams and in irrigation ditches and seepages, with or without vegetation. Other breeding places met with include swamps, flooded abandoned paddy fields, pools left at the sides of streams after heavy rains, pools of rain water not connected with any streams, polluted streams flowing through market garden areas, tracts of wet cultivation, a disused concrete washing place and in isolated pools in an otherwise dry stream bed heavily polluted with rubbish and human excreta.

There are a number of Chinese open-air laundries in the area under survey, operated at certain times of the year when weather conditions are suitable. These laundries usually consist of a concrete dam across the stream below which is a concreted washing place, constructed in the stream bed. The overflow from these laundries, containing a good deal of soap, has been noted to exercise a definite deterrent action on anopheline breeding. It has been observed that whereas larvæ of *A. minimus* are rarely met with for some distance below such laundries, nevertheless larvæ of *A. maculatus* and sometimes *A. hyrcanus* can be collected without much difficulty, although in smaller numbers than usual.

Although *A. maculatus* is an abundant and ubiquitous breeder the total adult catches of this species have been extremely small. The total number of adults captured bears but an insignificant relation to the enormous number of larvæ of this species collected in the vicinity of both human habitations and animal shelters. Comparative catches made on the same days from human habitations and animal shelters show that this species prefers the latter.

Evidence collected by the Government Malariologist in the Colony shows that *A. maculatus* adults are difficult to obtain from human dwellings, under normal circumstances, but that fair numbers can be collected from cow byres and pigsties—whilst precipitin tests carried out seem to show that this species prefers animal to human blood. Various observers have reported from time to time that this species leaves human habitations after feeding, and this has been confirmed in the Colony by evidence collected at Shing Mun.

Mosquito proofing of the coolie lines containing some 2,000 persons was commenced in September, 1933. Comparatively few adults of this species had been captured in the lines prior to their being mosquito proofed, but after screening had been carried out the total number of *A. maculatus* caught increased considerably—this increase was due to defects in the mosquito proofing, which arose from time to time, resulting in the huts acting as mosquito traps.

A. maculatus is considered to be a dangerous carrier of malaria in Malaya, and yet in this Colony, where it is by far the commonest species met with in larval surveys, it appears to be but of minor importance in this respect.

It has only been found infected in the Colony at Shing Mun and Wo Li Hop. In both these places *A. minimus* and *A. jeyporiensis* are the

primary carriers and it is considered that *A. maculatus* has become a secondary carrier due to the incidence of malaria in these districts.

This species has also been found naturally infected with filaria in the Colony and has been experimentally infected with subtertian malaria and with microfilariæ (*W. bancrofti*) by the Malaria Bureau.

A. hyrcanus.—This species is pre-eminently a market garden and swamp breeder and the larvæ were chiefly met with in stagnant water with vegetation.

It breeds abundantly throughout the year and was, next to *A. maculatus*, the commonest species encountered in the larval surveys.

Favourite breeding places noted were tracts of wet cultivation, swamps, flooded abandoned paddy fields, grassy edges of streams, and irrigation ditches where the flow was sluggish. Larvæ were also collected from pools with sandy beds in the flat portions of the hill streams (such pools were usually open, but sometimes shaded, and generally contained vegetation), shallow swamps, a disused concrete washing place, pools in grass after heavy rains and an irrigation ditch with a fairly swift flow and with but little vegetation.

It has been found to breed abundantly in both clean and heavily polluted water.

A. hyrcanus has been the commonest species encountered in carrying out adult catches in the area under survey. The total adult catch of this species from human habitations was, however, only about one-fifth of that obtained from animal shelters.

Evidence collected by the Government Malariologist at Shing Mun shows that *A. hyrcanus* like *A. maculatus* leaves human habitations after feeding. He has also found that this species does not figure to any extent in adult catches from human habitations, with the exception of the screened lines at Shing Mun, although considerable numbers have been obtained from suitable village pigsties and cow byres.

Although *A. hyrcanus* is the second commonest species encountered in the larval surveys carried out in the Colony it is but of minor importance as a carrier of malaria.

This species has also been found naturally infected with filaria in the Colony and has been experimentally infected with microfilariæ (*W. bancrofti*) by the Malaria Bureau, although attempts to infect it with subtertian malaria were unsuccessful.

A. karwari.—Larvæ of this species have been chiefly met with in swampy areas and flooded abandoned paddy fields, and to a much lesser extent in the flat portions of hill streams, where the flow was sluggish, either in rocky or simple pools (usually open, sometimes shaded), or along the grassy edges of such streams.

They have also been found occasionally in such places as irrigation ditches fringed with grass, tracts of wet cultivation, shallow sumps with grassy fringes, and pools left in grass after heavy rains.

It has been found to breed abundantly from August to December,

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chiefly in swampy areas and flooded abandoned paddy fields (cf. *A. jeyporiensis*).

Adults of this species are but rarely encountered—two were caught in human habitations and one in an animal shelter in the area under survey.

A. karwari has never been found infected with malaria in the Colony, and, so far as the author of this report is aware, no natural infections have been recorded in other countries.

A. splendidus.—Larvæ of this species have been chiefly met with in swampy areas and flooded abandoned paddy fields, and occasionally in open or shaded pools, containing algæ and vegetation, in the sandy beds of the flat portions of hill streams, along the grassy edges of such streams, in irrigation ditches and plots of wet cultivation.

It breeds most abundantly from August to December (cf. *A. jeyporiensis* and *A. karwari*), chiefly in swampy areas and flooded abandoned paddy fields.

Only one adult has been captured (from a pigsty) in the area under survey—elsewhere in the Colony a few adults are occasionally captured from time to time.

Two adults of this species have been found infected at Shing Mun and as far as the Government Malariologist is aware the only other record of infection of *A. splendidus* is that reported by Robertson at Saharanpur (1910). It is not therefore considered that this species is of any importance as a carrier of malaria.

It has also been found naturally infected with filaria by the Malaria Bureau.

A. aitkenii.—Larvæ of this species have been very rarely encountered in the area under survey.

They were all collected from pools in sandy beds of flat portions of hill streams. No adults of *A. aitkenii* have been captured in the area, nor has it figured yet in catches (adult) made elsewhere in the Colony by the Malaria Bureau. Christophers (1933) states that there is no evidence regarding its playing any part in malaria transmission.

A. tessellatus.—This species is rarely encountered in the Colony. Only one larva of this species was collected—it came from an open pool in a sandy bed of a flat portion of a hill stream. Pupæ of *A. tessellatus* have, however, been very occasionally met with in a plot of wet cultivation, in sandy pools in streams fringed with vegetation and edges of streams overgrown with weeds. Adults were bred out from these pupæ in the laboratory.

No adults of *A. tessellatus* have been obtained from the area under survey, although the Malaria Bureau collected a fair number from mat-sheds and pigsties in 1935 elsewhere in the Colony. It has been rarely met with in other years. It has been found infected with malaria on one occasion by the Malaria Bureau—one infection has been recorded in Dutch East Indies—it is not considered of any importance as regards malaria transmission.

A. vagus.—No larvæ of this species have been encountered during the survey—elsewhere in the Colony they have been collected from small muddy, grassy pools and from pools in rice stubble.

Two adults were captured from human habitations in the area—elsewhere in the Colony they have been collected in fair numbers from cow byres.

It has never been found infected with malaria in the Colony, and but rarely elsewhere, and is not considered of any importance as regards malaria transmission.

A. fluviatilis.—No larvæ of this species have been identified in the larval stage from area under survey.

The larvæ of *A. fluviatilis* very closely resemble those of *A. minimus*, differing only from them in certain very minor details. Distinction of *A. fluviatilis* from *A. minimus* in larval stages involves the taking of microscopic measurements—this takes up a good deal of time and, for reasons which will be given later, it was not considered worth while to distinguish between these two species in the larval stages.

The sum totals of larvæ of *A. minimus* identified as such probably include a small proportion which should have been classified as *A. fluviatilis*.

Adults of *A. fluviatilis* have, however, been bred out and identified from large larvæ and pupæ collected from open pools (usually with, but sometimes without, vegetation present), in sandy beds of flat portions of hill streams, a pool overgrown with weeds and fed by seepage, and the edges of an irrigation ditch.

Adults of this species were occasionally captured from human habitations, and to a lesser extent from animal shelters.

Some adults have been captured, or bred out from large larvæ and pupæ, which have proved to be exceedingly difficult to identify definitely as either *A. minimus* or *A. fluviatilis*, as characteristics distinctive of both of these species have been present in the specimens. The attention of the Government Malariologist, Dr. R. B. Jackson, M.D., D.P.H., was drawn to variations in the palpal markings of certain adults captured whose wing markings resembled either *A. minimus* or *A. fluviatilis*. Dr. Jackson, who had noted other distinct differences in palpal and wing markings of similar adults, has made a close study of this subject and has taken the matter up with Dr. Edwards at the British Museum whilst home on leave.

Although natural infection of this species with malaria in the Colony has not so far been recorded by the Malaria Bureau it should be regarded with caution, as it is considered in India to be an important carrier of malaria.

Its adult habits resemble those of *A. minimus*, whilst its breeding places are also somewhat similar.

Measures taken against *A. minimus* should therefore prove equally efficacious against *A. fluviatilis*.

(To be continued.)

CIRSOID ANEURISM, WITH SPECIAL REFERENCE TO A NEW METHOD OF TREATMENT.

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WHILE the term cirroid aneurism is that which is most commonly used in French and English literature, the condition which it designates has also been described as racemose aneurism, aneurism by anastomosis, pulsating angioma, and plexiform angioma. Although this tumour is not, in fact, a true aneurism—that is to say a localized dilatation of an artery—the term cirroid aneurism has nevertheless come into common use, because it indicates the salient features of the condition, its distinctive pulsatile character, and its varix-like appearance.

The literature on the subject is extensive, and it is not proposed to embody it to any extent in this communication. It is obvious, however, that the condition is one of considerable rarity. Elkin [1] states that the case which he reports is the first example of the condition occurring in about 35,000 admissions to the Brigham Hospital, Boston.

The aetiology of the condition has been discussed by numerous writers. Matas [2], MacCallum [3], and Delafield and Prudden [4] regarded it as a neoplasm. Aschoff [5] considers it to be an arterial angioma. The similarity between cirroid aneurism and arteriovenous fistula has been noted by numerous authors, and a few of them believed that the same cause explained both conditions, i.e. an abnormal communication between arteries and veins. As long ago as 1894, Wagner [6] was of the opinion that cirroid aneurism might arise in four different ways: (1) From a nævus or telangiectasis; (2) from a deep congenital abnormality of the blood-vessels; (3) from a single severe injury; (4) from a long-continued series of slight injuries. A number of writers have emphasized that trauma is the most frequent cause of cirroid aneurism. Occasionally infections may be responsible, and rarely, operative incisions. Congenital telangiectases, vascular nævi, or angiomata, which occur so commonly on the face and scalp, may be the starting point of a cirroid aneurism, although, even then, trauma is considered to be a factor.

The commonest site for the occurrence of a cirroid aneurism is undoubtedly the scalp. It may, however, occur in other situations, such as the hand [7, 8, 9], knee, foot [10, 13], uterus [11], mesentery [12], etc. The appearance of the tumour is typical and unmistakable. A soft, pulsating swelling is present which consists of a mass of tortuous and hypertrophied vessels, communicating with one another. A continuous bruit is audible on auscultation, and frequently a thrill is felt on palpation. The tumour is compressible, and if, after it has been compressed, the

arteries feeding it can also be compressed, the swelling does not recur until the pressure on the feeding vessels is relaxed. The chief complaint of the patient, in the case of cirroid aneurism of the scalp, is of a rushing noise in the head, and also of headache and giddiness (Rose and Carless). If untreated, the aneurism tends to increase in size, and may, when occurring on the scalp, cause atrophy of the skin and skull; thus it may ultimately communicate with the cerebral arteries, or it may rupture and cause death by hæmorrhage.

The treatment of cirroid aneurism has been for the most part unsatisfactory and fraught with considerable danger. Rose and Carless state that complete excision is the ideal, but in bad cases is impracticable. Diathermy with ligature of the main vessels, or of both external carotid arteries, is suggested as offering the best chance of success. It is certain that no permanent cure can be expected from ligature of the nutrient vessels alone owing to the very free collateral circulation which invariably exists; it is, however, a valuable first step in the treatment of these cases. Elkin [1] reports a case operated on with complete success by Dr. Harvey Cushing, in which both external carotid arteries were tied, and the tumour treated by complete exposure and puckering by numerous silk sutures; the scalp was then replaced and sutured. A. E. Roche [14] reports a small cirroid aneurism of the scalp, which he treated with success by a one stage operation. The operation, which took about an hour and a half, consisted in first carefully ligaturing all the nutrient vessels—a matter of considerable difficulty. The aneurism was then excised *en masse*, together with a disc of scalp tissue, and the resulting bare area covered by widely undercutting the wound margins and approximating them. The author points out the importance of treating these cases at as early a stage as possible. At one time or another, various alternatives to excision have been tried, such as the application of caustics, the use of electrolysis, and the injection of coagulating fluids. None of these have proved particularly satisfactory. The most recent contribution to the subject is by T. Clunie [15], who describes a case operated on by a method suggested by Searby [16]. The operation depends for its success on the easy stripping of thrombosed and oedematous tissue, including the aneurism, from the skin layer of a scalp flap. It is performed in two stages, the first of which consists in the turning down of a large flap of scalp tissue, including the aneurism, and ligaturing all bleeding points. Saline gauze is then packed between the flap and the bone and the flap loosely replaced. Ninety-six hours later the second stage is performed and the now thrombosed and oedematous aneurism is stripped off the skin of the flap and removed. The flap edges are then freshened and sutured back into position. An excellent result was obtained in the case reported, but it is to be noted that considerable hæmorrhage occurred at the first operation and a gum saline infusion was found to be necessary. The operation appears to be rather formidable,

except in the case of very small aneurisms, and the risk of severe hæmorrhage at the first stage appears to be considerable.

It will be seen that the treatment of this condition is by no means satisfactory and that the difficulties and dangers which may arise are considerable. Two cases are to be described in this article, and when the first of these was seen it was felt that a definite plan of campaign should be mapped out, in order to minimize the dangers of the treatment. It was, therefore, decided to deal with the case in stages. The preliminary stages were to consist of the tying of as many of the nutrient vessels as could be found, together with the injection of sodium morrhuate solution into the aneurismal mass. Subsequent injections of sodium morrhuate solution were to be given if necessary. The final stage was to be the radical extirpation of the sclerosed mass which should have resulted from the previous treatment. This plan was followed out in each case, and was found to be both extremely simple and perfectly successful. At no time was the slightest anxiety felt with regard to either patient, and the only disadvantage was the somewhat prolonged time it was necessary to have the patient under treatment.

REPORT OF CASES.

Case 1.—Private C. O., aged 22, was admitted to the Surgical Ward of the Lichfield Military Hospital on September 9, 1934. He stated that two years previously he had noticed a swelling on the left side of his head. No discomfort was produced by it, however, until about three months before his admission to hospital, when it appeared to be increasing in size, and he began to suffer from severe headaches. He was also much troubled by throbbing in the swelling. No history of injury could be elicited.

On examination, a typical cirroid aneurism was found to be present in the left parietal region. Its appearance before any treatment was instituted is shown in fig. 1. The tumour measured two and a half inches in diameter and marked visible pulsation was present. The superficial temporal, posterior auricular, and occipital arteries were tortuous and greatly hypertrophied. A continuous bruit was audible on auscultation over the mass. On compressing the swelling firmly with the palm of the hand, and then applying a rubber band firmly around the head, just above the ears, the pulsation ceased, and the swelling did not reappear until the rubber band was removed.

The first operation was performed on September 20, 1934. The patient was anæsthetized with avertin, and ether was administered through a Shipway's apparatus. A rubber band was then applied around the head as a tourniquet, and, through small incisions the superficial temporal, posterior auricular and occipital arteries were tied in their continuity. It was noticed that in spite of the presence of the tourniquet, the whole area was extremely vascular, and very free bleeding occurred. This, however, was easily controlled, and did not prove a source of difficulty. Two cubic

centimetres of a 5 per cent solution of sodium morrhuate were then injected into the aneurismal mass, the tourniquet was removed, and a dressing and firm bandage applied. In injecting the sodium morrhuate solution no attempt was made to inject it into a vessel; it was simply injected into the mass of the aneurism. On the day after the operation considerable pain was complained of. The aneurism appeared to be smaller in size, and did not pulsate; it was quite firm on palpation. The next day the patient was quite comfortable, and no pain was complained of. On September 27, the



FIG. 1.—Appearance before treatment.

aneurism was appreciably smaller, but slight visible pulsation was present. There was no bruit on auscultation. A large vessel was now feeding the aneurism from the occipital region and it was determined to tie this. Accordingly, on September 29, the patient was again anæsthetized and the tourniquet applied as before. The vessel, which was evidently a branch of the occipital artery, was then tied. Two cubic centimetres of [sodium morrhuate solution was again injected. On October 6 the aneurism was definitely smaller, firmer, and more localized. Slight visible pulsation was still present, but no large nutrient vessel could be discovered.

On October 9, the tourniquet was applied, and two cubic centimetres of sodium morrhuate solution were again injected.

Subsequently all pulsation in the mass ceased, it became smaller and firmer, and the skin over it developed a slight bluish-red tinge.

On October 28 the final radical operation was performed, the anæsthetic used being the same as at the first operation. The tourniquet was applied, and a horse-shoe shaped flap of scalp was turned down, completely exposing the tumour. The aneurism was found to be entirely sclerosed, and all its

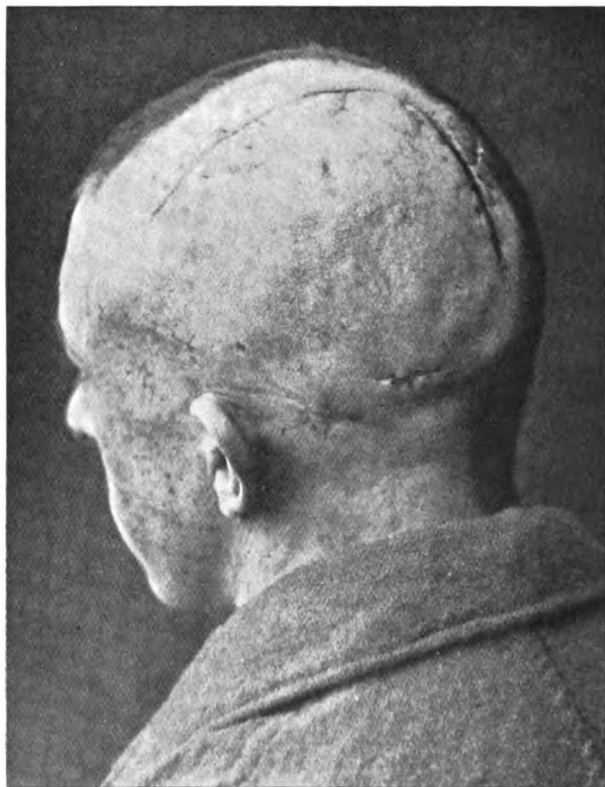


FIG. 2.—Appearance at conclusion of all treatment.

vessels were thrombosed. No difficulty whatever was found in removing it entirely, and there were no bleeding points which required ligaturing. The flap was replaced and sutured, a small drainage tube being left in its posterior angle. An ample dressing and a firm bandage were applied. A small hæmatoma subsequently formed under the flap, but this was easily evacuated through the drainage tube, and the latter was removed at the end of a week. The sutures were removed on November 8, when the wound was quite healed with the exception of the portion where the drainage tube had been inserted. By November 20 the wound was soundly healed, and the excellent result obtained is shown in fig. 2.

Case 2.—Quartermaster Serjeant W. M., aged 36, was admitted to the Military Hospital on February 24, 1935, on account of profuse hæmorrhage which had occurred from a slight abrasion of the lower lip.

On examination a large pulsating tumour was found to be present on the left side of the lower jaw. Visible pulsation was present, and a loud systolic bruit was audible on auscultation. The tumour was soft and compressible and was evidently vascular in nature. It involved the left side of the chin and lower jaw, and the left side of the lower lip. The

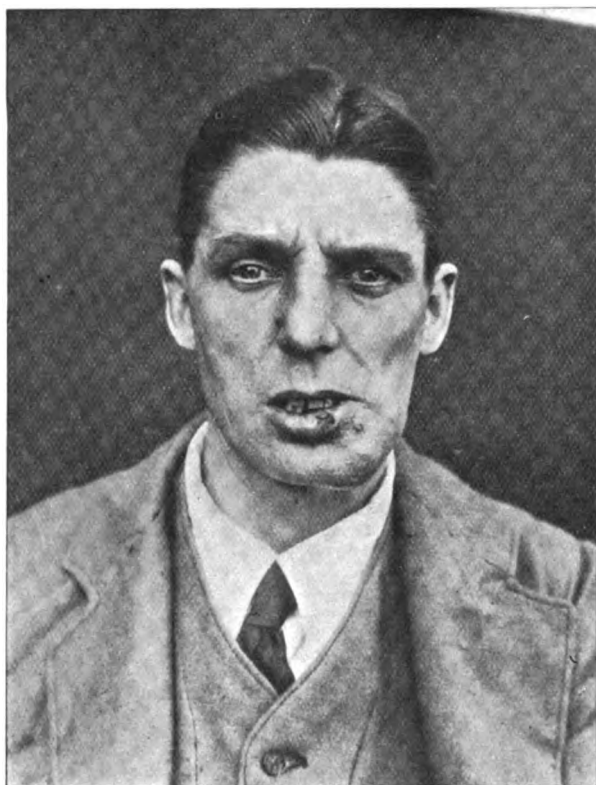


FIG. 3.—Appearance on admission to hospital.

main nutrient vessel appeared to be the left external maxillary artery. The mouth was grossly septic and several teeth required extraction. Dental treatment was therefore instituted as a preliminary, and seven teeth were extracted by the dental officer on March 6. The appearance on admission to hospital is shown in fig. 3.

By March 12 the mouth was reasonably clean, and operative treatment was therefore undertaken on March 14. The anæsthetic used was avertin, followed by intranasal ether. The left external carotid artery was exposed and tied between its superior thyroid and lingual branches. The right

external maxillary artery was tied just below the ramus of the mandible. When this had been performed the vascular mass had ceased to pulsate, and two cubic centimetres of sodium morrhuate solution were injected into it. The day following operation, the patient was comfortable, and all pulsation in the tumour had ceased. It was, however, somewhat enlarged and tender. On March 20 the anterior part of the tumour was hard and firm. The sutures were removed from the operation wounds, which were soundly healed. The appearance at this stage is shown in fig. 4.

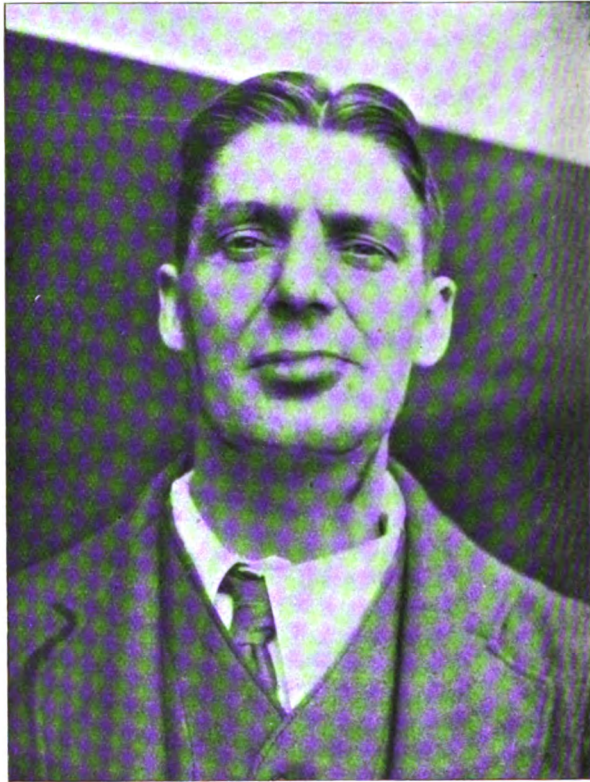


FIG. 4.—Appearance after first operation.

Subsequently, injections of sodium morrhuate solution were given on March 28, April 3 and April 11. By the end of April the tumour appeared to be completely fibrosed, and no pulsation whatever could be detected. The final operation was carried out on May 2, and the patient was anæsthetized as before. A flap was turned down exposing the aneurism which, as in the first case, was found to be fibrosed. The mass was completely excised without any difficulty, although hæmorrhage was rather profuse, but was easily controlled. The wound was sutured, and a small glove drain inserted. Healing by first intention took place, and the patient

was discharged from hospital cured on May 21. Unfortunately a photograph of his final condition was not obtained, but the result was excellent in so far as the main mass of the tumour was concerned. Some permanent swelling of the left lower lip remained, but this was inevitable, unless a portion of the lip were removed, which was considered to be unjustifiable. When re-examined a year after discharge from hospital, the result was still excellent, and the man expressed himself as completely satisfied.

SUMMARY.

The condition known as cirroid aneurism is discussed, and the successful treatment of two cases is described. The treatment adopted was preliminary ligation of all obvious nutrient vessels and sclerosing injections of 5 per cent sodium morrhuate solution, followed by complete extirpation of the aneurismal mass. This treatment was found to be so easy, free from danger to the patient, and so successful in its end-results that it is suggested it might well form a basis of a routine to be adopted in the treatment of these difficult and rare cases.

I wish to record my thanks to Lieutenant-Colonel A. P. O'Connor, M.C., R.A.M.C., Commanding Officer of the Lichfield Military Hospital, for his kind permission to send these cases for publication, and also my indebtedness to Major F. T. Boucher, R.A.M.C., whose excellent anæsthesia contributed in no small way to the successful operative treatment of them.

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HISTORICAL NOTES ON BARRACKS—SCOTTISH COMMAND.

BY LIEUTENANT-COLONEL G. A. KEMPTHORNE, D.S.O. (R.P.).

It took many years to convince our forefathers that a standing army had become necessary for their existence, and, long after that necessity dawned on them, they tried to forget the fact by studiously ignoring the claims of their soldiers to any reasonable living accommodation in time of peace. But the troops had to be housed somewhere. Until the Act of 1909 the law of England never allowed billeting in private houses, though it was at times evaded, notably by both James and Charles II. When in 1699 the second Mutiny Act permitted the use of ale-houses it was only supposed to apply to troops on the march. The possibility of the soldier being otherwise circumstanced than engaged in fighting, or on his way to fight, was not considered. Shelters for the use of companies which formed the permanent garrisons of fortresses must always have existed, but as late as 1704 the total barrack accommodation in the United Kingdom provided for no more than 5,000 men. The term "marching regiments" was therefore a very appropriate one in the eighteenth century, for the unfortunate soldier at home was generally on the move. In Scotland before the Union, wider powers of quartering troops were enjoyed, and these continued to be exercised later. The first British soldiers to make the acquaintance of barracks are said to have been those of the Dunkirk garrison, who, in 1659, occupied special buildings constructed there by the Spanish and so designated.

In the seventeenth century there were permanent garrisons in the castles of Edinburgh, Stirling, Dumbarton and Blackness, maintained to well into the nineteenth century. The Stirling company, established by Mary of Guise, was in 1818 incorporated into one of the veteran battalions. The Edinburgh company met the same fate at the same time.

While General Monk was completing the subjugation of Scotland after the battle of Dunbar, garrisons of English troops and Scottish irregulars were maintained for some years. For their housing, and with a view to dominating the surrounding country, at least four great forts were built. Of the Cromwellian citadels at Leith, Ayr, Perth, and Inverness, hardly a trace remains. For their construction, houses, churches and tombstones from the churches were requisitioned. The strongholds served their purpose too well to be popular and were dismantled at the Restoration when they became convenient stone quarries for the neighbourhood.

General Mackay's campaign in the reign of William III. again brought English troops into the country. Fort William at the foot of Ben Nevis, another of Monk's forts, was restored and regarrisoned in 1690. It held out in the rebellions of 1715 and 1745. One face of this fort was bordered by a navigable arm of the sea and on the land side were several rapid

streams. Maryborough adjoining was built as a bazaar for the garrison, the buildings being of turf and timber so that in case of a siege they could be demolished at short notice. The fort was sold by Government in 1860. The Governor's house, part of the rampart and the gateway arch are preserved. After 1715 a fort and barrack were built at Inverness where the ruins of the medieval castle were renovated under the name of Fort George, and another fort was made at the extremity of Loch Ness which received the name of Fort Augustus. They were garrisoned at first usually by independent companies of Highlanders. Both fell in the '45. The former was demolished by Charles Edward, the latter, later rebuilt, had a garrison till 1867. It is now the site of an abbey. Fort Charlotte at Lerwick in Shetland was built in 1781 on the ground occupied by a fort dating from the first Dutch War. Centred on the larger forts were a number of smaller fortified barracks. Ruthven Barracks at Kingussie, about thirty miles south-east of Inverness, the ruins of which can be clearly distinguished from the train in passing, is an interesting example. This post was formed by General Wade about 1725 on the site of an ancient castle. The buildings comprise two plain three-storied blocks and a store-house defended by a wall with two bastions. There were loopholes for musketry, but no gun emplacements. The place was pluckily held by Serjeant Mulloy and twelve men against two hundred of the Pretender's troops in 1745, but succumbed to a bombardment with field guns a few days after Culloden. It was still occupied seven years later when it was garrisoned by a detachment of the 20th foot.

The year following the Culloden campaign troops were encamped in the great hollow close by the end of Loch Ness round Fort Augustus. The fort was strongly reconstructed, all the available troops being employed in a continuation of the strategic roads commenced by General Wade. Few troops were, however, available until the return of the Army from Flanders in 1749, when several regiments were sent to Scotland, among others James Wolfe's regiment, the 20th. They had little rest. In February they were in billets at Stirling, in March at Glasgow. In November they had moved to Perth. In October, 1750, they were at Dundee, and in April, 1751, at Banff. The same year they went to Inverness, and in May, 1752, headquarters were at Fort Augustus with officers' guards at Ruthven, Invercomrie, Laggan Achadrom, Braemar Castle, and at the head of Loch Arkaig. In connexion with these were smaller posts commanded by N.C.O.s.

Life in these small garrisons was unattractive. Food was scarce and the shortage of meal and fuel involved much hardship on the men's families. The troops were employed in the suppression of popish priests, controlling the activities of recruiting agents from across the Channel, protecting the agents who administered the forfeited lands, and the arrest of the unfortunate inhabitants who had not converted their kilts into trousers. Similar posts were centred on Inverness and Fort William. When in September, 1753, Wolfe commenced his long march back to civilization, work had

already commenced on the new Fort George sited on the Moray Firth about ten miles from Inverness.

Except in the ancient castle of Stirling, where the royal palace is still in military occupation, the oldest barracks now occupied in the Scottish Command are those of Berwick-on-Tweed, commenced in 1707 and completed in 1719. Cavalry regiments at this period seem to have been distributed wherever billets could be found for them, which at the same time corresponded with the policy of the government in the employment of small parties of troops as police for dealing with possible civil disturbances. In August, 1761, we find the 17th Light Dragoons with their headquarters at Perth and detachments at Falkland, Aberdour, Cupar, Culross and Leven. In September of the following year headquarters were at Haddington and detachments at Dalkeith, Dunbar, Hamilton, Musselburgh, and Linlithgow.¹

By the year 1792 the question of accommodating the troops in England and Scotland had become so pressing that some action was inevitable. Among the arguments used against barracks were that they would tend to distinguish the soldier too definitely from the citizen and form a military caste which could be used in enforcing unpopular legislation ; or again, that the presence of barracks in towns would be bad for the inhabitants' morals. But Pitt, who was anxious about the growing unrest caused in the industrial centres by the French Revolution and the absence of any civilian police force, took the matter up, appointed Colonel Oliver Delancey, a D.A.G. at the Horse Guards, Barrack Master General, and told him to carry on. To avoid parliamentary criticism, the cost was to be met under the head of "Extraordinaries of the Army." This officer seems to have had few qualifications for such a great financial undertaking ; his accounts were not subject to audit, and gross peculation and scandal resulted. However, in a few short years the British Army was moved from ale houses into barracks.

As one of the objects in view was the prevention of civil disturbances, many of the new barracks were small and widely dispersed, with the result that they later became useless and were sold. Between 1792 and 1796 barrack construction was in progress in Scotland at Edinburgh Castle, Piers Hill, Dumbarton, Dundee, Perth, Hamilton, Ayr, Glasgow, Stirling, and Aberdeen.

Pitt's barracks frequently took the shape of a square and were surrounded by a strong wall so as to render them defensible and at the same time to prevent the soldiers' breaking out. The officers' quarters formed one side of the square, as it was considered that they could thus better keep an eye on the men's discipline. A feature of these old messes is the

¹ Whether owing to available accommodation or for strategic reasons, we find units thus dispersed in much later times. In 1871 the 90th with Headquarters and 4 Companies at Glasgow had 3 Companies at Stirling, 2 at Ayr, and 1 at Dundee.

Royal Arms solidly and handsomely engraved in stone on the front as at Ayr, Hamilton and Perth. The barracks built when the Brigade Depôts were formed in the 'seventies are more open, but are provided with armouries in defensible keeps. Glencorse is an example.

It is unlikely that in the construction of the eighteenth century barracks questions of hygiene received much consideration, and due allowance has to be made for the state of sanitary knowledge at the time. Compare the revelations about Queen Victoria's drains at Buckingham Palace fifty years later. Unflushed privies were commonly associated with shallow drinking water wells, and up to 1847, out of 19 barracks in Scotland, only three had any ablution room. But the great cause of mortality, which in Scotland between 1817 and 1821 was at the rate of 15 per 1,000, and in London 19, as compared with 11 among the civil population, was overcrowding. The space in the rooms, already sufficiently small, was further reduced by the tiers of wooden cribs in which men were packed in fours, and by the screens the married men put up to ensure some privacy for their wives. Sir James McGrigor mentions the fact that half the cases in his regimental hospital at the end of the eighteenth century were suffering from typhus or ulcerated legs, suggesting the activities of the body louse in favourable surroundings. Respiratory diseases produced then, and for many years later, a high mortality.

Robert Jackson, whose treatise "On Armies" became a classic, had definite views on barrack construction. As regards the soldiers' comfort he held the opinion voiced by more than one commanding officer before the Royal Commission thirty years later that his proper place was on active service and his condition in barracks should, so far as was consistent with health, approximate to the same, "lest he should miss his luxuries when he went to war." Bedsteads he considered superfluous as furniture and injurious as luxury. "The double tier of platform obtaining in most barracks contaminates the air by artificial condensation, favours the generation of the cause of contagious fever, and thereby tacitly and indirectly annihilates the Army." Jackson thought the soldier should lay his paillasse on the floor. He properly insisted on better ventilation, but to ensure this, he proposed French windows, a combination which sounds rather draughty. The Duke of Wellington did not agree with the idea of sleeping on the floor, and it was due to him that every soldier was provided with a bedstead of his own.

By 1850 the allowance of cubic feet per head had been fixed at 500, but it is doubtful how far it was enforced. A writer in the "Aide Memoir to the Military Services," edited by a committee of Royal Engineer officers in that year maintained that for married women to sleep in barracks was objectionable and subversive to the moral of the Army, that privies were disgusting and should be flushed with barrack slop water impounded for the purpose, and that officers should have water closets.

Fortunately for the Army the public interest aroused by the gallantry

of the troops in the Crimea and the administrative scandals of that campaign did not subside before it had included an investigation of the conditions of the soldier's life in peace time. For this the soldiers owe a debt of gratitude to Sidney Herbert, the War Secretary, who took up the question with energy, while Miss Nightingale constantly spurred him on to further efforts. In 1855, a committee under Viscount Monck was appointed to report on the barrack accommodation of the Army. A number of commanding officers and others appeared as witnesses, some of whom were very suspicious of the introduction of any novelties. The report insisted on a 4-foot wall space per head and an interval of at least eight feet between opposite beds. Dining rooms were discussed, but objected to by several witnesses on the ground that they would involve more labour in keeping clean, that they would tend to debar the men from their barrack room, and that sooner or later they would be misappropriated as sleeping rooms. The recommendation was that meals should be eaten in batches of fifty in the cook-house; proper kitchens should replace the existing sheds, which had boilers only and no ovens. Ablution rooms with taps and basins were necessary. In most cases the soldiers, like the gentlemen of Winchester College, were still washing under the pump. Fortescue suggests, though perhaps on rather slender proof, that the urine tub was sometimes employed for ablutions. There was one barrack bath in the United Kingdom—in the basement of Wellington Barracks—others should be provided. The unspeakable privies were to be converted into slop latrines, ventilated drains made, and public water supplies used when available. As regards the married soldier, the usual arrangement was either to put one married man with his wife in each barrack room or several families in one room. When the married quarters at Stirling were authorized in 1875 there had lately been four families to a room. The wives were expected to clean the barrack rooms and sometimes do the cooking. "One decent sober woman" was authorized under regulations dated fifty years before for the regimental hospital. At Edinburgh Castle the families were accommodated at the time in the arched basement of the "New Block," stated to be subject to frequent visitations of smallpox. There were, however, already a few single-room married quarters and the building of more was advised.

Errors in the external arrangement of barrack buildings were criticized. A common feature was the siting of blocks close up to the boundary wall. In the narrow interval, workshops, latrines and cooking sheds were crowded. Several were built so as to form a square with the angles closed in, and many storied blocks were built in preference to detached buildings. As an example of bad internal arrangement the Edinburgh New Block was referred to as "exhibiting one of the most objectionable instances of closed internal corridors in existence." This, however, was to house a battalion for the next half century. For recreation, racquet and ball courts were suggested. It was before the days of army football. Finally a reform in

the management of regimental canteens, up to then farmed by Government to rascally contractors, was urged.

Sidney Herbert died in 1861 worn out by his administrative labours, and the same year saw the appearance of the report of the Commission on Barrack Accommodation since which all new construction has been in accordance with the prevailing sanitary ideals. In 1882 the P.M.O. in Scotland reported the majority of barracks in the Command still of primitive construction, but much improvement followed in the next ten years. Drainage, water supply and ventilation were attended to, and hot baths provided. Dining rooms were not at first favoured, but there was one at Ayr in 1891. Examples of all periods of barrack construction may still be seen in the Command. Berwick, where the actual buildings form a strong, square, stone castle; Hamilton and Perth, where the buildings are arranged in a rectangle surrounded by a strong wall; Maryhill (1876) comprising isolated blocks on a wide open space surrounded still by a loop-holed and bastioned wall; Glencorse was improved in the 'eighties with its defensible keep; Redford, built like a hotel, with barrack rooms, dining rooms, lavatories and institute under one roof.

In the year of Trafalgar there were twenty-six barracks in Scotland, which included hirings in Edinburgh, Leith, Haddington, Seaton, Preston, Musselburgh, Dalkeith, Dunbar and Eyemouth. In 1832 there was nominal accommodation for 8,268 other ranks, the number present being 5,710. The 573 beds in the various hospitals were occupied on the day of the return by 259 patients. In the 1847 return Blackness and Dumbarton Castles are shown as evacuated. Fort Charlotte (Lerwick) which accommodated 240 other ranks, and Fort Monckton 280, had been given up, Fort William and Fort Augustus had care and maintenance parties. Fort Augustus, dating from 1817 was sold in 1857, Fort William (1690) in 1860. Apart from garrisons still surviving, there were then barracks at Paisley built 1820, and Dundee, 1796.

The normal peace garrison of the Scottish Command in the nineteenth century appears to have been two battalions of infantry, sometimes English, a cavalry regiment, and garrison artillery. The Army List of 1867 shows the depots of the Highland regiments grouped at Aberdeen and Stirling in two "depot battalions"; the Lowland regiments had not yet returned to the fold. The depot of the Royals was at Chatham, of the 21st Fusiliers at Preston. The 1881 Army List contains a preliminary grouping—subsequently amended after much heartburning—of the regiments junior to the 25th, under the Cardwell scheme: Aberdeen 92/93, Perth 42/79, Fort George 71/78, Stirling 72/91, Hamilton 73/90 and 26/74, and Glencorse Royal Scots. These were called Brigade Depots. Berwick-on-Tweed was then the depot of the 5th (Northumberland) Fusiliers. In 1883 the present grouping had been adopted and the location of the depots were as now, except that the Highland Light Infantry shared the depot at Hamilton with the Cameronians, and the Cameron Highlanders were with the

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Seaforths at Fort George, pending the construction of their new barracks at Inverness.

SCOTTISH COMMAND BARRACKS.

Aberdeen.—Depot Gordon Highlanders, Castle Hill Barracks, long condemned, evacuated 1935 for the new barracks at Bridge of Don. A plain oblong building of three stories built 1796 to hold 600 men, cost £16,000, enlarged 1880. Accommodation 1832 stated to be for 400. Noted in 1877 as the only barracks where gymnastics were regularly practised. King Street Militia Barracks sold 1877. There is little trace of the old castle.

Ayr.—Depot Royal Scots Fusiliers. The Barns of Ayr, a temporary barrack erected by Edward I on the south-east of the town, burnt by Wallace with 500 occupants 1297. Cromwell's Citadel was built here after the battle of Dunbar, a hexagonal work extending from Fort Street to the sea, covering twelve acres. It was demolished at the Restoration. Present barracks built for infantry 1795. Ablution arrangements 1847, two pumps. The 2nd Battalion of the 21st Fusiliers was raised at Paisley in 1858. The regimental depot was sited here in 1873.

Berwick.—Depot K.O.S.B. The town still has its Elizabethan walls and there are traces of fourteenth century fortifications. The barracks, built in 1719, form a square stone castle. Walls are of massive thickness, the rooms hold five men each. In 1847 they were allotted for 10 men, women, or children, and total accommodation was for 16 officers and 640 other ranks, hospital 48. There is a handsome coat of arms over the gate. It became the depot of the King's Own Scottish Borderers 1891.

Ballater.—Barracks for the company of the King's Guard when Balmoral is occupied. The castle was acquired by Queen Victoria about 1852.

Dunbar.—One Battery, R.A. The old castle was dismantled by the Regent Murray, 1567. Battle of Dunbar 1650. Hutments for all arms erected here and at Haddington 1803 and demolished 1814. Embodied militia billeted 1854-1856. Dunbar House (the present administrative block) and two houses in High Street including the New Inn (Officer's Mess) bought for militia barracks 1859. Existing barracks of excellent type built during Lord Haldane's reforms.

Edinburgh Castle.—Infantry Detachment, Military Hospital and one Company R.A.M.C. Old plans show that about 1710 the banquet hall on the south side of the Crown Court was used to house 400 men. There was also a barrack at the south end of the ground later occupied by the "New Block." The Banquet Hall, drastically restored 1886, had been used for many years before as the hospital. In 1740 quarters for six officers were built on the west side of Crown Court, now occupied by the museum. Opposite the Banquet Hall was St. Mary's Chapel, founded by David I, which in the seventeenth century became a powder magazine. In 1775

the Chapel was succeeded by a barrack which, remodelled by Robert Billings at a later date, became the North Barrack. This was succeeded again in 1927 by the Scottish National War Memorial.

The New Block, which remains intact, was completed and handed over in 1799. Its strong walls render alteration and demolition alike difficult. The rooms open off dark corridors and are approached by stairways to which the light of day never penetrates.

The hospital, completed in 1898 in the "Scottish Baronial Style," occupies the site of the old armoury. The name of Aesculapius in Greek characters, with his emblems of a cock and a serpent, are over the door. Between 1803 and 1805 a house in Fisher Row was hired from William Hogg as a general hospital. It had five medical officers, a deputy purveyor, steward, matron and head nurse. The matron's pay was 2s. 6d. a day, the head nurse's 1s.

The governor's house, dating from the early eighteenth century with the two officers' quarters on either side, now provide accommodation for one field officer and nursing sisters. Some of the original panelling remains.

Piers Hill Barracks (Edinburgh).—Old cavalry barracks built in 1793. Colonel Piers' villa was incorporated in the officers' mess. Occupied in later years by R.A. batteries. Recently evacuated and for demolition. As usual in barracks of that date, the barrack rooms are over the stables.

Redford Barracks (Colinton).—One battalion and a cavalry regiment. Modern barracks occupied just before the Great War when the troops left the Castle. Barrack rooms originally had individual cubicles. Artillery barracks projected at Dreghorn adjacent.

Fort George (Ardersier).—One battalion and Depot Seaforth Highlanders. On a projection of the Moray Firth ten miles from Inverness. A polygonal line of fortification with six bastions. Built in 1748 at the cost of £160,000. Formerly had a governor and lieutenant governor. History uneventful.

Glasgow (Maryhill).—Infantry battalion and Depot H.L.I. Old infantry barracks in the Gallowgate built for 1,000 men, 1795. Cavalry barracks in Eglinton Street (1821), sold as a poorhouse 1850. Maryhill barracks completed 1876 for an infantry and cavalry regiment when old barracks were evacuated and demolished. The narrow, isolated, two-storied blocks are surrounded by a strong loop-holed wall which incloses a wide area. The military hospital is included. The dépôt buildings, war barracks of flimsy construction, were occupied by the Highland Light Infantry about fourteen years ago.

Glencorse.—Depot Royal Scots. The site of the old mansion house made into a dépôt for French prisoners 1804. A reference to this in "Manual of Military Law," p. 143. In 1813 plaster and wooden buildings for 6,000 prisoners and quarters for the guard erected. Shown as dismantled 1832, when it was known as Greenlaw Barracks. A military prison 1845-1888. Became a brigade dépôt about 1875. The new Douglas Barrack, destroyed

by fire 1881, and replaced in stone. Armoury located in a defensible building. Barracks have been modernized, but the old troops' quarters of the time of the French wars remain—guard room and cells. The depôt has a fine park adjoining it.

Hamilton.—Depôt, the Cameronians. Built as cavalry barracks 1794, since converted. Was a depôt for four regiments in 1881, and continued to be the depôt of the Cameronians and H.L.I. till the latter moved to Maryhill after the Great War. The buildings are undermined by coal-pits. New depôt projected at Lanark.

Inverness.—Depôt, Cameron Highlanders. The present castle (1834-76) is on the site of Malcolm Canmore's stronghold commanding the town. It was renovated and barracks built 1718, when it was called Fort George. Captured with its garrison of two independent companies of highlanders and 88 regulars, with 16 cannons and 100 barrels of beef, in 1745 rebellion. It was then blown up. Cromwell's citadel (1652-57), near the mouth of the Ness, demolished at Restoration. Present Cameron Barracks on a projection of the plateau east of the town, completed 1885, cost £60,000.

Leith Fort.—Headquarters, Coast Defence R.A. and R.A.S.C. A gateway called "Cromwell's Barracks" off Commercial Street is all that remains of the citadel built by General Monck. The present fort dates from 1779, when the privateer Paul Jones was threatening the coast. Barracks added 1782, and many additions and improvements carried out of recent years.

Perth.—Depôt, the Black Watch. The old castle was at the end of Skinner's Gate. Cromwell's citadel (1652) on the S. Inch demolished. The Edinburgh road passes over it. Present barracks were built 1793, including cavalry stables, now converted. Remodelled 1876, and soon after became a brigade depôt. Bath room built 1879. Accommodation 1832, 23 officers, 480 other ranks, 20 patients.

Stirling Castle.—Depôt Argyll and Sutherland Highlanders. Existing buildings are not older than the sixteenth century. They are very handsome and externally well preserved. The barrack rooms occupy the site of the Parliament Hall much mutilated in 1777. State rooms of palace serve as dining room and institutes. The original fireplaces are preserved and the walls are hung with trophies of arms. The large dining room of the officers' mess contains the old regimental colours which are laid up here. The military hospital, now a reception station, has for many years occupied Argyll's lodging outside the walls. It bears the arms of Sir William Alexander, who built it in 1630. Later the property of the Argyll family, it was occupied by the Duke of Cumberland in the 1746 campaign.

The military prison was moved to Stirling about 1888, but the building has now been given to the town. The R.A.O.C. barracks stand on the river bank. "King's Stables" is the site for twenty-five married quarters.

Standing Camps.—There are hutted camps at Stobbs, near Hawick, where the castle is used as an officers' mess, and at Barry and Buddon on the Firth of Tay, near Dundee.

Coast Defences.—There are small barracks, not in regular occupation, in connexion with the various coast defences—obsolete or otherwise. The nine gun battery built at Broughty Ferry on the Tay in 1861, occupied the site of the fifteenth century castle. In the Forth, masonry forts with barrack accommodation were built on Inchkeith, Inchcolm, Inchgarvie, and on Kinghorn Ness in 1876-81. These were previously occupied in the Napoleonic wars, and the first two were held by English garrisons as far back as 1547. Inchkeith was in the fifteenth and sixteenth centuries a dumping ground for plague patients, who were told to stay there “till God provide for their health.” Inchcolm, the site of a famous abbey, is now undefended, but had a battery till after the Great War.

THE SCHOONER "ISABELLA"—CONVERSION FROM TRADER TO YACHT.

BY MAJOR-GENERAL H. CARR. C.B.

IN my previous article I brought the history of the "Isabella" up to the end of her conversion to a yacht. I now propose giving a brief account of our experience while in commission.

After about six months in Camper Nicholson's yard she was moved to Calshot and moored off the Flying Boat Station. Below decks she was practically finished and furnished, but aloft much remained to be done to rigging and spars, and her square sails were unbent; these tasks were completed slowly by the skipper assisted by brother officers. However, as all were keen to try her under sail, she was got under way with only fore and aft canvas and we made various short trips in the Solent and towards Spithead.

These revealed various shortcomings in trim, affecting her steering and sailing. She therefore returned to the yard for more ballast and other alterations—amongst them being additions to the after end of the rudder which had been omitted by the yard at Par while undergoing repairs in dry dock.

With these alterations and with our square sails bent we had some very pleasant week-end sails, but owing to the skipper not being able to get away from duty, could not take extended cruises.

The combined experiences of these trial trips brought it home to us all in no uncertain manner that without a reliable motor, "Isabella" would be too large a craft to handle safely in narrow waters and anchorages crowded with small craft. Accordingly, she again returned to Camper Nicholson's and as already mentioned in my previous article, a 70 Ruston Hornsby Diesel engine was installed. Owing to pressure of work in the yard, and the time taken in making a suitable propeller, etc., it was not until August 17 that we left finally for the engine trial with a representative of the engine makers' firm on board.

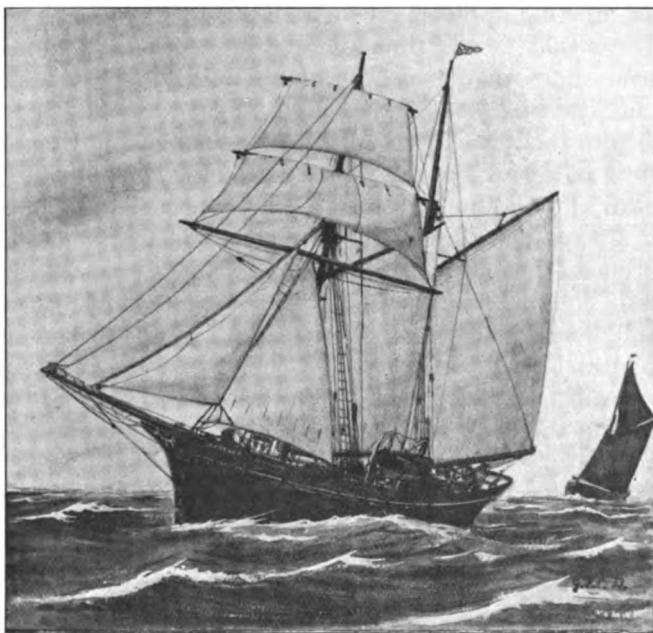
Advantage had been taken of being hauled up to give her a coat of anti-fouling, and black enamel her top sides, besides touching up varnished work and giving her decks an extra coat of oil and red oxide.

From this time on all went well and we were immensely pleased with her performance both under motor, sail and the two combined.

We had some first-rate sails to Poole, but unfortunately were unable to get further west. The skipper developed an acute appendicitis necessitating an operation and rather long convalescence.

On September 1 we sailed for Poole to attend the gathering of the 12-foot International Dinghies. The sail down was easy with a beam

wind, and a run from Old Harry into Sandbanks, where the races were held, but the next day, and all the three days following, it blew great guns and the little dinghies had a real rough time. On the first morning there were forty-six starters, and the congestion and confusion on the line was indescribable, masts breaking and boats filling on all sides, many boats being quite out of control. In the afternoon conditions were even worse. Twenty-four started, four masts were broken, and ten boats upset; only nine finished the course. The next day racing was impossible, but on Sunday the programme was completed in a half gale. On this



"Isabella" of Barrow. Capt. Carr, Master.

occasion "Isabella" carried a full complement—three in the after cabin, five in the main cabins and two in the fo'castle.

On Sunday night our cable took a turn round the anchor fluke and we dragged right through a number of small yachts, bringing up against a mudbank, without fouling anything.

On returning to Southampton, the skipper decided to lay up for the winter in Woodbridge, Suffolk, as the weather was so unpleasant. Being unable to get a crew he decided to take her round to the East Coast himself with the assistance of one lad and his wife, against the advice of all his yachting friends.

This was successfully accomplished without any adventures despite rather thick weather and poor visibility. He and the boy kept two-hourly

36 *The Schooner "Isabella"—Conversion from Trader to Yacht*

watches for the two nights, getting some rest during the day when his wife and another girl on board took the wheel. He had a fair wind most of the way and carried full sail from the Nab to the entrance to the River Diben, not using the engine after passing the Warner light, finally tying alongside the quay at Woodbridge where she now lies.

From this very dull narrative it can be gathered that we had only a short time to try out the yacht and had no cruise of more than three days continuous sailing, but there was quite enough wind to prove her a stiff, comfortable sea boat ; very easy to handle and reasonably fast.

The first question everyone asks—do you not require several paid hands to manage her, making up-keep expensive ?

The answer is that all the time she was in commission we had no paid hand and never more than a couple of amateurs, mostly inexperienced. The skipper, assisted by his wife, could get under way—the motor control is on deck close to the wheel. It is rather hard work getting the anchor, but the winch is powerful and the motor can help.

The mainsail and foresail are heavy work when short-handed, but the final pull can always be made by the winches which also are used by the aid of snatch blocks for hauling up the motor launch and any heavy work.

To be really comfortable one requires one paid hand who also works below deck and helps in the cooking and washing up—better still a deck hand and a pantry boy.

The square sails give no trouble once the gaskets are cast off ; all the work is done from the deck and they can be let go and clewed up to await stowing at leisure.

For a long passage in comfort six are required, that is three watches of two each, but four can work her without much strain.

The Diesel engine gives no trouble but it is essential that a full 300 pounds pressure be maintained in the air bottle for starting.

During the winter a Koehler electric lighting plant was installed in the engine room, supplying ample current for all purposes.

To make the outfit quite complete and luxurious we now only require a motor to actuate the winch. An air compressor to guard against loss of air-pressure and consequent starting trouble has been installed.

PAIN IN THE RIGHT ILIAC FOSSA.

BY MAJOR K. FLETCHER-BARRETT,

Royal Army Medical Corps.

I AM writing these few notes on a condition which is seen frequently in the Service, and suggesting a line of action which I have had opportunity of observing during the last six years or so, and which has given uniformly good results in my experience.

It is the immediate care of a case which is sent into hospital as acute appendicitis, and is illustrated perhaps best by giving a hypothetical case.

A young soldier is sent into hospital labelled "acute appendicitis." He gives a history of abdominal pain—very often vague in character—which is now situated in the right iliac fossa and has been present for anything up to thirty-six hours. He may or may not have vomited, sometimes even he has not had any nausea. Often he states that his bowels have been open daily. He has had no previous abdominal symptoms, and can give no suggestion as to the causation of his pain. His temperature is not above 100° F., and his pulse is round about 80. Very often both pulse and temperature may be normal.

On examination the tongue is slightly furred. There is no distension, the abdomen moves on respiration giving rise to little or no pain in doing so. The right rectus muscle is slightly "on guard," but there is no definite rigidity; sometimes the rectus does not even tighten on pressure in the right iliac fossa. However, there is definite tenderness on pressure over McBurney's Point; often the patient "catches his breath" as pressure is being made. The presence of hyperæsthesia is doubtful. Usually backward pressure on the descending and transverse colon, i.e. "milking their contents backwards" gives rise to pain in the right iliac fossa. If pressure is made in the left iliac fossa and suddenly released, this sometimes gives rise to pain in the right iliac fossa.

Movements of the right leg frequently give rise to pain, particularly voluntary contraction of the psoas muscle against resistance. Rectally there is usually no tenderness. (It cannot be too often stressed that a rectal examination should be made in all cases of a suspected intra-abdominal lesion. The tip of a long gangrenous appendix may be lying in the pelvis, and can only be detected per rectum.)

To sum up the situation, the tongue is furred, and there are signs and symptoms of greater or lesser severity, pointing to a lesion in the right iliac fossa; but not of sufficient severity to suggest early or established peritonitis.

SUGGESTED ROUTINE TREATMENT.

- (1) The patient is put to bed in the highest Fowler position.
- (2) He is given a turpentine enema, irrespective of whether he states that his bowels have been opened or not. Commonly one sees a large constipated stool follow a turpentine enema in a man who states that his bowels have been open daily. Perhaps this is due to a fear on his part that if he admits to constipation he may be given a dose of castor oil.
- (3) He is given water only by the mouth.
- (4) A white blood-cell count is done. If this is much above normal, a more serious view of the situation is taken.
- (5) A hot-water bottle to the right iliac fossa is permitted if the patient does not settle down immediately ; but this is not insisted upon.
- (6) The pulse and temperature are charted half hourly—I insist upon these being charted and not just dotted down on a scrap of paper, which as often as not promptly gets lost.
- (7) I give instructions that should his symptoms become worse or should his pulse rise above 100, I am to be sent for.

In my experience, these cases resolve themselves into one of four categories:—

A. Those whose signs and symptoms rapidly subside so that they are quite fit in forty-eight hours.

B. Those who gradually get better, taking four or five days in the process.

C. Those who remain stationary.

D. Those—the minority—who become worse.

Now as regards further treatment. Category A, I discharge to duty with instructions to report sick immediately should similar pain recur.

I am fully aware that many surgeons are of the opinion that once a person has had an attack suggesting appendicitis, he should have his appendix removed on the ground that he may have another attack in some place far away from surgical assistance. This is a bogey which I do not think justifies a laparotomy in every case of this category ; there is always a certain risk in a laparotomy, and often the possibility of adhesions and other troubles to follow.

Should an acute attack supervene in an out-station, the patient can always be sent to the surgeon or the surgeon can go to the patient. The *immediate* danger to life of an average attack of appendicitis is very small, and does not justify opening up every abdomen where there is pain suggestive of appendicitis. In support of my opinion, I would mention that I have recently seen two cases of appendix abscess (in Indian soldiers), which had not been treated on the lines I am suggesting here. One of these was sent 150 miles over extremely bad roads by ambulance ; the other came 160 miles by train. I operated upon both these cases and they made excellent recoveries.

Here I would digress for one moment to suggest that in cases of appendicitis in which pus is present in the abdominal cavity, only the *minimum* possible should be done. I advise that a tube through a separate stab wound should be put to the site of the pus and a similar tube drain into the cavity of the pelvis; the laparotomy wound should be closed. I give antistreptococcal (20 cubic centimetres), and antigas-gangrene (10 cubic centimetres) sera. I consider that under no circumstances should protective adhesions be broken down in order to remove the appendix. However, the appendix *should* be removed some six weeks to two months after the wounds have healed.

In Category B, I advise appendicectomy but do not press the point if the patient demurs.

In Category C, I suggest that appendicectomy should be performed ten to fourteen days after the onset of the initial symptoms.

In Category D, immediate laparotomy is indicated as soon as one or more of the following signs or symptoms appear: (a) High or increasing white blood-cell count. (b) Increase in pain, rigidity or tenderness. (c) Pulse rate of over 100.

In conclusion, I would like to mention two more points:—

(1) I have found spinal stovaine anæsthesia, usually preceded by morphia, $\frac{1}{4}$ grain, half an hour prior to operation, highly satisfactory. If necessary this anæsthetic can be combined with open ether: recently, I removed the whole of the ascending colon and part of the transverse colon in a case of carcinoma of the hepatic flexure in a young soldier, using this combination of anæsthesia with very little difficulty and no distress to the patient.

(2) Should I be called to see a case such as I have described in an out-station some distance from my own station, I always remove the appendix, because I feel it unwise to leave a case which might have an exacerbation and progress into Category D.

Probably these observations will be redundant to many medical officers, but I hope that they will be of value to some, as it is often forgotten that the “art of a surgeon is to know when *not* to operate.”



Editorial.

LONDON'S WATER SUPPLY.

THE Thirtieth Annual Report of the Director of Water Examination, Metropolitan Water Board, gives the results of the Chemical and Bacteriological Examination of the London waters for the year 1935.

In the Introduction to his Report Lieutenant-Colonel Harold states that in 1933 the London water supply yielded 85·5 per cent of first-class supplies, a figure which was advanced to 95·7 per cent in the period under review, while out of a total of 280·7 million gallons no fewer than 131·6 million gallons were delivered at the remarkable standard of purity of 98·1 per cent. That this 10 per cent improvement was effected during years of unprecedented drought is considered to be no mean achievement.

Even the quality of the water terminally treated provided an improved figure of 3·2 per cent, the result of more efficient works control brought about by whole-hearted co-operation between the engineering and water examination departments. Further confirmation of this co-operation was found in the records of the Grand Junction slow sand beds, which have been raised above the 70 per cent efficiency line, this being the accepted standard of a good slow filtration station.

The Director considers that when it is realized that these results were obtained at the relatively small expenditure of £2,780 for equipment installed, including cost of the reconstruction of the Surbiton chlorinating house during 1934 and 1935, further point is given to the idea that chloramine is the "safety first" of water works practice.

The growth of the Metropolis and the development of its industrial towns gave cause for increased anxieties and necessitated stricter control of the Kent and other wells. The rapid and intense industrialization brought in its wake threats to the supplies through the influence of oil wastes. The records showed that such pollution is very difficult to control and the best course to pursue is elimination at the source.

Colonel Harold writes that "among the outstanding incidents of the year may be reckoned 'an attack of the vapours' by Queen Mary reservoir, the key reservoir of the supply, with a capacity of 6,700,000,000 gallons. The cause was climatic in origin resulting in a sudden de-oxygenation which, fortunately, did not extend beyond the lower strata, but rendered the water unusable by reason of smell and taste." Hurried laboratory tests showed that the taste was unaffected by permanganate, but amenable to treatment by activated carbon; stocks of this were quickly made available. What might have proved a grave situation terminated happily within a few days, when the reservoir was again brought into use, following on the use of activated carbon, backed by the ingenuity of the local engineering staff.

The conditions which led up to this were as follows : There had been for some weeks a spell of warm calm weather. The plankton of the reservoir had been characterized by a considerable production of green algæ, copepods and rotifera, the last named being exceptionally numerous. From the third week of July there was a gradual falling off of plants and samples taken in August showed a complete absence of algæ ; copepods and rotifers were present in enormous numbers. The peculiar weather conditions and the abundant consumers of oxygen led to the bottom layer of water being completely devoid of oxygen. This de-oxygenated condition favoured anaerobic fermentation, giving rise to marked smell and taste and was also associated with the development of a fungus, *Cladothrix dichotoma*.

The first action was to take the reservoir out of supply and draw on the Staines reservoirs. The bottom water of Queen Mary reservoir had deteriorated to a marked degree and it was feared that this might be progressive if the reservoir was allowed to stand without the circulation which has been found to be essential.

The dry feed alum plant at Kempton Park Works was used as a means of dosing with activated carbon. As soon as examination proved that the bottom layers were once more oxygenated the Queen Mary reservoir was brought back into full use.

In August there were complaints of taste and smell in the Island Barn reservoir and tests at once showed that the bottom layer was completely de-oxygenated. There was a difference of 5° C. between the temperature of the surface and bottom layers. In this case the waters were highly algal. The chief causative factors must have been climatic.

Since a difference of temperature between the surface and bottom layers will provide valuable evidence that a condition of stratification is, or is about to be, established a self-recording thermometer was installed near the outlet in Queen Mary reservoir. In the construction of new reservoirs it is intended to fit such thermometers as a standard practice. They are arranged to record temperatures from three depths.

In the Bacteriological Section of the Report it is stated that the Board have their own standard of waters on a coli basis laid down in the Thirty-Second Report of the Medical Officer of the Local Government Board in 1902-03 and accepted for the London supply by the Metropolitan Water Board and Local Government Board in 1907. With regard to the supply in service one standard of water only is approved and that is *Bacillus coli* must be absent in 100 millilitres. That is water so pure that it gives no evidence of pollution even with so small an amount as 0·00001 per cent of sewage. The Board are of opinion that the public has a right to expect and demand a water of the highest purity.

In a survey of the "Thames as a source of potable water" in last year's report it was stated that the streptococcal findings supported the coli results. The streptococcus confirmatory test has proved its value in establishing the grade of purity of swallow holes, springs and wells. From

polluted wells, rivers and effluents faecal streptococci could be isolated by direct inoculation on Conradi-Drigalski plates. In the case of rivers and good wells MacConkey's medium was more successful.

The *Clostridium welchii* test did not follow the coli index as closely as the faecal streptococcus. The best results were obtained by heating the samples to 80° C. and incubation at 37° C. in litmus milk ; under these conditions a better correlation with the coli and streptococcus results was obtained.

A source of anxiety was a minute green copper-resistant flagellate alga, a species of *Chlamydomonas*, which appeared in May. Like the motile *Oscillatoria* this organism has the power of penetrating sand filters, even when they are yielding a first-class filtrate. Treatment with cupri-chloramine proved effective, providing complete protection to Hornsey, although the New River was olive-green in colour. Though it was effective against the vegetative forms, the *zygotes* with the contained spores were resistant to all treatment ; they passed into the Stoke Newington reservoir, where subsequent treatment failed to eliminate them. Colonel Harold writes that " Professor Fritsch the eminent algologist, associated these outbreaks with earthen banks, and it is certainly significant that the three outbreaks recorded during the past twenty years have all occurred in the New River which has a puddled bed. There would also appear every necessity for strictly limiting the work on this conduit during the summer to the necessary repairs and weed cutting. The use of the river for the transportation of even the cuttings of the grass verges should be strongly opposed."

In the Biological Section it is pointed out that the plankton of a river differs very markedly from that of a lake. In the Board's undertakings river water is impounded in reservoirs ; the result is a complete change in the plankton. Thames water taken from the Laleham intake may contain a sparse collection of diatoms and only a few crustacea, while the waters in Queen Mary reservoir are coloured green with *Eudorina* and contain thousands of rotifers and crustacea per litre. Viewed from the point of view of algal control, it would be considered better to use the raw Thames water, but reservoirs are necessary to provide reserves for periods of drought and storage decreases the number of bacteria and improves the chemical constitution. Some species of alga give more trouble than others ; *Tabellaria* and *Asterionella* may cause tastes ; the small *Cyclotella* passes through primary and tends to clog the secondary beds. *Oscillatoria* also passes through filters. This species gives rise to trouble as it cannot be sedimented by alum and tends to accumulate on the surface in masses.

There may be great differences in the flora of reservoirs obtaining their water from the same source. In order to avoid algal growth it is important to have good circulation through the reservoir. In any new reservoir the position of the inlet and outlet will have to be carefully planned so as to keep a large body of the water on the move.

Observations extending over many years have shown that there are commonly two periods of great plankton production; the one in the spring, the other in the autumn. The spring maximum is due almost entirely to several species of diatoms of which *Cyclotella*, *Stephanodiscus*, *Asterionella*, *Melosira*, and *Synedra* are mentioned. The autumnal maximum may be due to diatoms, but blue-green algæ such as *oscillatoria*, as well as such green algæ as *Eudorina* and yellow-green *Trebonema* may often surpass the diatoms in abundance.

Supplies of vital inorganic salts may be markedly reduced following such algal outbursts. It is suggested that the concentration of nitrates, phosphates, and silicates may fall so low as to be a limiting factor.

Variations in the silica content of the Board's water may cause trouble to consumers employing softening processes. The bulk of these employ the "base exchange" method in which sodium alumino-silicate is one of the constituents. When there is a deficiency of silica in the water disintegration and loss of the softening agent occur and replacement of this material may entail an expenditure of several thousands of pounds annually. A few measurements made last year suggest that the periods when trouble is experienced with softening correspond with those when there is great production of diatoms which, being enclosed in a frustule of silica, make heavy demands on the existing supply.

The Board's records show that the amounts of available nitrogen have a regular seasonal fluctuation. The values are highest in the winter and early spring. It has been found that the concentration of oxidized nitrogen in Queen Mary reservoir, where plankton is high, is regularly lower than in the Thames, where plankton is not so rich, and the suggestion is made that the lower value in the reservoir is due in part at least to the greater demands made upon the nitrogen by the plants. When a regular dose of copper sulphate was used at the intake of Queen Mary reservoir there was a decrease in algæ and an increase in the concentration of oxidized nitrogen.

In the Walton reservoir the concentration of oxidized nitrogen is high, and judged by resistance to filtration and the general works experience it is free from excessive algal growths.

In the control of algal growths chloramine and cuprichloramine have been found to be very efficacious. In the older copper sulphate method of treatment data as to the necessary lethal concentrations for individual species are available. In order to obtain similar data for cuprichloramine experiments were commenced in 1934 and have been continued in 1935. As it is difficult to determine by macroscopic and microscopic examination when death of the species has occurred, endeavours are being made to cultivate planktonic algæ under laboratory conditions, using methods similar to those employed in bacteriological cultural technique. It is thought that the cultivation of algæ *in vitro* will also enable observations to be made on the inorganic foodstuffs used by the algæ and the influence of light on their growth.

Clinical and other Notes.

A CASE OF PROBABLE CHANCRE REDUX.

BY LIEUTENANT J. F. WILSON,
Royal Army Medical Corps.

THE patient, a brewery worker, aged 38, reported at the Venereal Diseases Department of the Royal Infirmary, Edinburgh, complaining of "a lump on the penis" occurring at the site of a sore which he had had nine or ten years previously.

History.—In 1923 there was a typical indurated ulcer in the coronal sulcus which had been present for one week, having appeared ten weeks after exposure to infection. *Spirochæta pallida* were found by dark-ground examination but the Wassermann was negative. The treatment was 9 grammes of arsenic, 6·75 grammes of bismuth and 31 grains of mercury given during two years. The Wassermann reaction was persistently negative, and at the end of treatment the Wassermann and colloidal gold reactions and globulin content of the cerebrospinal fluid were negative.

In July, 1934, the Wassermann was negative.

In 1936 he complained only of the small lump on the penis. The patient stated definitely that there had been no re-exposure to infection as he had had no coitus for three years.

Clinical Examination.—Nothing could be seen on examination, but a very firm elastic mass measuring three by one centimetres could be felt on the inner surface of the prepuce adjacent to the coronal sulcus. This nodule was circumscribed and not attached to the skin or underlying tissue. There was no erosion of the surface. Nothing else abnormal was found on clinical examination. The Wassermann reaction was negative.

When the reaction was repeated with the Kahn and Sachs-Georgi reactions, all were negative. The nodule was scarified but no *Sp. pallida* could be found and it was then excised for histological examination.

A week later the wound was healing normally but was surrounded by a ring of tissue, about one centimetre in depth, having the same consistence as the original lesion.

A provocative injection of 0·3 gramme of neo-kharsivan was given.

Ten days later the wound had healed completely and the raised margin had been replaced by fibrous tissue. The three serological tests were again negative.

Histological Examination.—The epithelium was normal. Immediately below the epithelium the corium was invaded by large numbers of small mononuclears and plasma cells and the capillaries of the superficial plexus were congested (fig. 1).

Beneath this zone the fibrous tissue was increased in amount. Scattered

throughout it were numerous areas of proliferating endothelial cells with giant cells and surrounded by mononuclears and plasma cells (fig. 2).

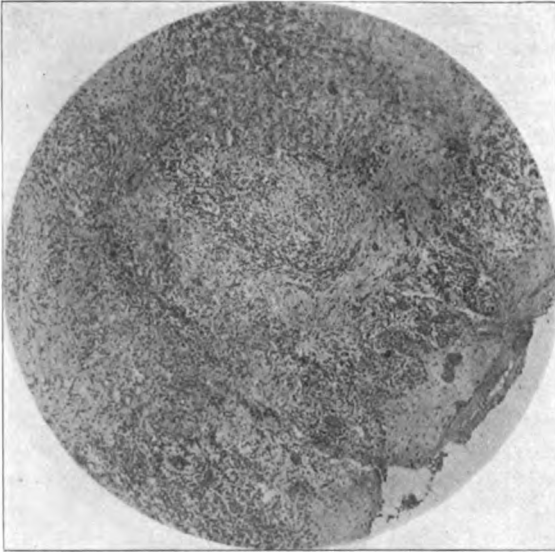


FIG. 1.—Stain H. and E. ($\times 40$.)

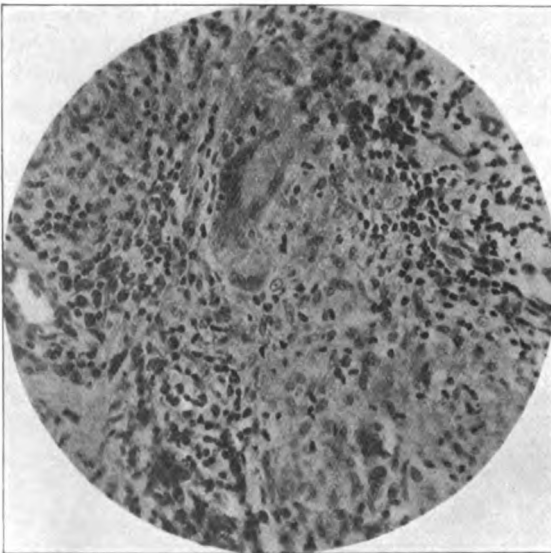


FIG. 2.—Giant cells and proliferating endotheloid cells surrounded by a zone of small mononuclears. Stain H. and E. ($\times 200$.)

Several of these giant cells had finely granular homogeneous cytoplasm and numerous deeply staining nuclei arranged in horse-shoe fashion round the

periphery of the cell. Others were smaller with only three or four nuclei and without the same ground-glass appearance of the cytoplasm.

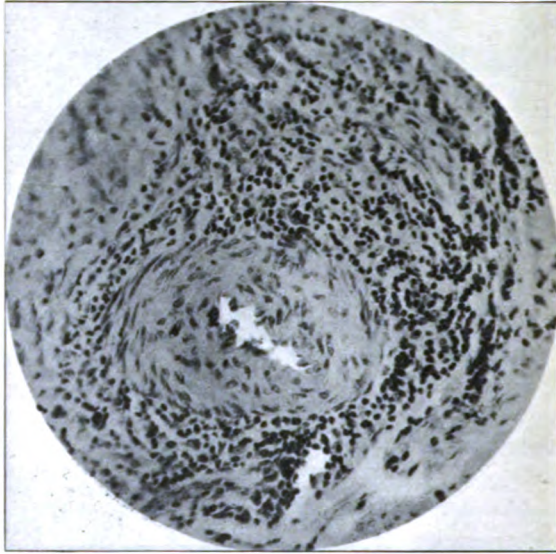


FIG. 3.—Subcutaneous arteriole. Endarteritis and cupping. Stain H. and E. ($\times 200$.)

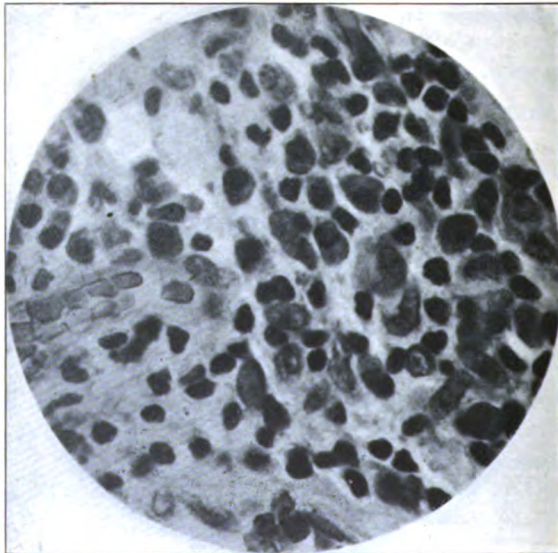


FIG. 4.—Plasma cells and small mononuclears from the perivascular infiltration. Stain H. and E. ($\times 850$.)

There were a few small areas of commencing necrosis, but this was not a marked feature in any part of the section. Young granulation tissue was associated with some of these areas.

All the arterioles showed endothelial proliferation (fig. 3). This was most noticeable in the subcutaneous arterioles where there was also a marked perivascular infiltration by mononuclears and plasma cells (fig. 4).

No spirochætes, tubercle bacilli, or other organisms could be demonstrated by appropriate methods of staining in any of the sections examined.

There was insufficient tissue for animal inoculation.

DISCUSSION.

The typical chancre redux or pseudo-chancre redux is regarded as being a circumscribed, gummatous, non-erosive nodule occurring at the site of the primary chancre. Dark-ground examination is negative but the Wassermann reaction is usually positive. There is no adenitis [1].

This case is fairly typical but the diagnosis presented several difficulties. The patient had had treatment which is even yet regarded by some as adequate, and the serological tests were persistently negative even after a provocative injection of arsenic.

Therefore the diagnosis had to be made from the histological examination. To make an absolute diagnosis by this means alone is generally considered impossible [2]. The difficulties are stressed by Capell [3], who describes, among others, a case similar to this.

There are several histological appearances in this case which are more suggestive of a gumma than of other granulomatous lesions. These are:—

(1) The endarteritis and perivascular infiltration of the subcutaneous arterioles at some distance from the actual lesion.

(2) The infiltration by plasma cells as well as by mononuclears.

(3) The small amount of necrosis with preservation of structural outline.

(4) The presence of granulation tissue indicating a tendency to heal.

The sudden healing of the lesion, for which the provocative injection of arsenic might have been responsible, is also a characteristic of a gumma.

These factors combined with the history, gross appearances and absence of any other signs of tuberculosis or other possible cause for the lesion led to the diagnosis of a gumma.

The clinical term "Chancre Redux" has been used to include three conditions [4]. (1) The relapsing chancre or true chancre redux which occurs a few days after the primary chancre has healed and generally follows chancres in which there has been abundant induration. (2) The pseudo-chancre supposed to be due to a superinfection. (3) The chancreiform gumma which is a tertiary lesion.

The first of these is excluded by the time at which the present condition occurred and the second by the definite statement of the patient that he had not been exposed to any reinfection.

The lesion belongs to the third group and is simply a gumma developing on or near the site of a previous chancre.

The treatment received appears to have been inadequate in spite of the persistently negative serological tests.

SUMMARY.

(1) A case clinically of "Chancere Redux."

(2) Being a gumma occurring at the probable site of the primary chancre ten years after supposed cure in a patient with negative serological reactions.

I wish to thank Dr. Batchelor, Physician-in-charge Venereal Diseases Department, Royal Infirmary, Edinburgh, for permission to publish the case, Mr. Tom Dodds for the photomicrographs and Lieutenant-Colonel R. W. Vint, R.A.M.C., for permission to forward particulars of the case for publication.

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THE CAUSE OF SORE FEET AMONGST TROOPS AND A SUGGESTED REMEDY.

BY CAPTAIN E. J. CURRAN,
Royal Army Medical Corps.

WHAT are the causes of sore feet amongst troops? This is a perplexing question of great moment and one which causes much anxiety to many a Commanding Officer. He naturally considers that there must be some chemical which either applied externally or taken internally would obviate the crop of blisters and abrasions which incapacitates his men and depletes his ranks. Surely the "doctor" must know. The Medical Officer is approached and finds it a very tricky question to answer. An old dictum reverberates in the back of his mind—remove the cause—but then it is too late, the cause has taken effect. Being "extraordinary tactful," he falls into line with the Commanding Officer and agrees, perhaps rather against his better judgment, that various applications have a protective effect. Alum, potassium permanganate, formalin, etc., and divers other solutions are suggested. The men conscientiously steep their feet, but on the line of march the inefficacy of the treatment becomes manifest. Too late to shut the stable door when the horse is gone. We humans are too ready to bid the devil good-morrow when we meet him. The fact is that the treatment should have been instigated the very day the soldier first donned an Army boot.

It is painfully obvious that before embarking on a march that a properly-fitting pair of boots is a *sine qua non*. This is not thoroughly realized. Frequently the fitting of boots is carried out in a perfunctory fashion.

We are all cognizant of the changes that take place in the shape of the

foot when the individual is carrying a load, and the necessity for roominess in the boot to allow for lengthening and broadening of the sole. There is a factor of much greater importance. Boots are of a standard size and shape but feet vary. A boot may be suitable in length and breadth but is not necessarily a good fit. It must conform to the irregularities of the particular feet. It must be moulded into shape, and this can only be done by constant wearing. To assist this process dubbin or oil must be assiduously applied to render the leather pliable.

What are the conditions obtaining in the average infantry regiment? The man is supplied with two pairs of boots, one the "dubbed" pair and the other the "parade" or "polished" pair. The latter are highly polished and worn every day. The former are retained in the barrack room and dubbed religiously prior to inspection. They are rarely worn, and certainly never marched into shape. Once a year the battalion goes into training camp and an edict is published that dubbed boots will be worn, or rather that all boots will be dubbed (this is the usual wording). What happens? The sensible man realizes thoroughly that the boots he wears every day are the most comfortable, and are well moulded into shape and therefore obviously the ones to wear on the line of march! He dubbins the "polished" boots and marches out. These men get along quite well, but are apt to get pinched insteps—the result of the hardening of the uppers from constant polishing. It is the man who puts on the "dubbed" boots for the first time who really suffers. The moulding process which should have taken place in barracks has now to be done in the first fifteen miles, with no respite. Blisters and abrasions appear at small pressure points previously unnoticed, or at least undetected. The blisters rupture and septic infection is frequent. Short of total incapacity, he is so dreadfully uncomfortable that his marching efficiency is definitely impaired.

The problem presents two aspects: (1) Feet, (2) boots.

The care of the feet is comprehensively dealt with in the appropriate manuals and needs no elaboration. There are, it is true, various chemical substances which render the skin tougher than normal, some of which I have already mentioned and have tried with doubtful benefit. To obviate blistering and abrasions, apart from the removal of irritation, the superficial layer of the skin must be thickened in some way. I am perfectly certain that the application of chemicals has little, if any, effect in this direction. What is required is the optimum amount of frictional irritation to stimulate the growth of the horny layer of the skin. To produce this effect I consider that walking in bare feet is the best method. I would suggest that there should be a specially prepared track on every parade ground where men are compelled to put in a certain amount of time walking in bare feet daily. This method would do more to harden the feet and lessen the sensitivity to trauma than anything I can think of. Rather a far-fetched idea, but still feasible.

Boots should be fitted when the man is carrying a full marching load. A couple of sand bags of the required weight might be kept in the quartermaster's store for this purpose. The individual should put on the boots and march up and down the room for a few times before accepting them. Any tendency merely to hand to the individual a pair of Army boots of the size similar to those normally worn in civilian life is to be deprecated. All boots should preferably be dubbined and each pair should be worn on alternate days in barracks. Should a polished pair be considered necessary for appearance sake on parade, the dubbined pair should be worn frequently.

In spite of all that one can do, blisters and abrasions will appear. The treatment of these conditions varies with the individual's tastes and experience. There is one method which I strongly recommend and have personally carried out in a large number of cases, it is particularly efficacious for large intact blisters. The blister is first aseptically punctured and thoroughly drained through a large hypodermic needle which is left in situ. Through this needle a quantity of a solution of 20 per cent tannic acid in 1:1,000 Hg perchloride, sufficient to distend the blister, is injected. The needle is then withdrawn and the aperture sealed with collodium. In this way the solution is kept in contact with the underlying raw surface. Within an hour or two it will be found that the raw base of the blister will be healed and perfectly dry and hard. I have proved this by removing the pellicle of the blister. It strikes me to be a particularly good and effective treatment. Blisters so treated in the evening will be completely healed up next day. Exposed abrasions after thorough cleaning may be treated as above, the solution being applied on a dressing.

To conclude, one cannot lay too much stress on the proper fitting of boots and the necessity for their thorough moulding into shape.

A treatment has been described which, I think, is worth a trial.

SEPTIC ABORTION TREATED WITH "PRONTOSIL."

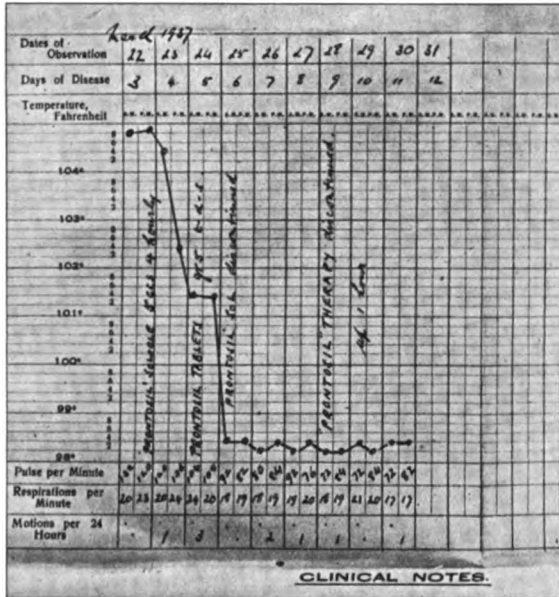
BY CAPTAIN R. ST. J. LYBURN,

Royal Army Medical Corps.

THE patient, aged 35, the wife of a non-commissioned officer, had on two previous occasions successfully brought about abortion by using sea-tangle tents. On this occasion in spite of preliminary sterilizing of the tents in alcohol for twenty-four hours, the procedure was unfortunately followed by acute metritis and septicæmia.

The patient was admitted to the Military Families Hospital, Moascar, on March 22, 1937, two days after the complete or partial expulsion of the foetus had occurred, suffering from hyperpyrexia, repeated rigors, and acute pain in the left iliac fossa. She was very ill, in spite of stating that she felt extremely well—the condition of euphoria.

The pulse was weak and thready—rate 132. The white cell count was not unduly raised. There were no signs of peritonitis. Blood cultures were not taken as the patient was undoubtedly septicæmic.



On the evening of admission five cubic centimetres of "Prontosil" soluble were given intramuscularly and repeated every four hours.

The following day the patient still looked very ill and was delirious. Headache and sleeplessness were very troublesome.

On March 24 the temperature had fallen to 101.7° F. and the pulse was 104. The pain in the left iliac fossa had diminished considerably. As Bayers recommended that "Prontosil" tablets be used with the "soluble" brand in severe cases, these were procured and one tablet (5 grains) was given three times a day.

Next day she was much improved. Temperature was 98.2° F. and pulse 92. The "Prontosil" soluble was discontinued and the tablets alone given (5 grains) three times a day. The improvement in the patient's condition from the previous day was remarkable.

On March 26 the temperature and pulse were normal. Appetite was returning. There was no headache. She slept well. "Prontosil" tablet (5 grains) given twice a day.

On March 28 the patient was convalescent. "Prontosil" therapy discontinued.

The patient was discharged from hospital on April 2, 1937.

When she has regained her normal health an investigation will be

made to ascertain whether, or not, any foetal fragments are left in the uterus.

Recently "Prontosil" has been acclaimed to be a very effective cure in staphylococcal and streptococcal septicæmias.

This case would appear to support this claim.

I am indebted to Lieutenant-Colonel S. M. Hattersley, M.C., Royal Army Medical Corps, Officer Commanding, Military Hospital, Moascar, Egypt, for permission to send these notes for publication.

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Echoes of the Past.

WAR EXPERIENCES OF A TERRITORIAL MEDICAL OFFICER.

BY MAJOR-GENERAL SIR RICHARD LUCE, K.C.M.G., C.B., M.B., F.R.C.S.

(Continued from p. 414, vol. lxviii.)

CHAPTER XXIV.—LIFE IN JERUSALEM.

Life in Jerusalem during the months we occupied the German Hospice was by no means unpleasant. Our quarters were comfortable, almost luxurious. Good German beds and bedding, which included even the well-known German eiderdown covers, were very pleasant to campaigners who had been away from such luxuries for nearly a year. The Hospice combined the characteristics of a first-class hotel, a palatial residence for the Kaiser or any of his family who might care to visit Jerusalem, and a monument placed on the most imposing site in the vicinity of Jerusalem to be a constant reminder to the inhabitants of the greatness of the nation who had placed it there. The magnificence of the place itself and the beauty of its surroundings were most stimulating, while the thought that we had succeeded by our victory to the prestige of the builders, could not fail to stir the imagination of even the most matter-of-fact and most prosaic of British soldiers.

The only drawback was the cold during the winter months. There was not a particle of fuel to be had in Jerusalem and exposed as the building was to all four quarters of the heavens, not even its double windows could keep out the cold. We sat shivering in our greatcoats at our work and crept gratefully under our eiderdown pillows as soon after dinner as was legitimately possible. The weather in winter, though frequently

cold and stormy, was never bad many days together and during 1917-1918 the snow never lay long on the ground, though it fell on several occasions.



The Garden of Gethsemane.



Damascus Gate, Jerusalem.

Soon after my return from leave in March we had a spell of very bad weather during which the troops, especially the camel drivers, suffered greatly from frost-bite and trench feet.

We were not without little excitements to keep us from becoming bored. On March 19 we had a visit from the Duke of Connaught who stayed at the Hospice with Sir Philip Chetwode. The Hospice among its other functions included that of being the headquarters of the German Branch of the Order



Duke of Connaught, with Sir Ronald Storrs, visiting the Mosque of Omar.



Duke presenting Medals in the citadel, Jerusalem.

of St. John of Jerusalem, and the best suite of apartments was set apart for the Grand Master of the Order, Prince Eitel Fritz, when he cared to make use of them. This suite was occupied during his visit by the Duke, who curiously enough is the Grand Master of our own branch of the Order.

On March 19 he held an investiture of orders and presentation of medals, on behalf of the King. The ceremony took place in the Turkish barrack square, just within the old city and immediately beneath the two towers, which form part of the citadel and are the strongest point in the defences of the western face of the city wall. One is the so-called Tower of David. This part of Jerusalem is known to have been spared by Titus when the city was destroyed, as it was occupied by the Roman garrison. Though the upper structure of the two towers is comparatively modern, their bases are almost certainly those of two of the three towers built by Herod the Great and named by him after his brother Phasaleus, his friend Hippius and his wife Mariamne, whom he had put to death in a fit of rage and jealousy, and whom he mourned with such remorse as was possible to him for the rest of his miserable days.

The scene of the investiture was a picturesque one. The old Duke stood in the centre, a fitting representative of the family whose history is so closely bound up with that of the nation they have ruled over, and of the monarch whose personality epitomizes all that is best in the character of the British race. He was supported by Sir Edmund Allenby and a goodly number of the Generals who had led the British Force so far and so successfully. Looking on in the background, stood the old towers which witnessed the triumphal assaults by Titus on the doomed city, and the long succession of vicissitudes through which the city has passed during the nineteen centuries since that day.

One of the distractions of campaign life evolved by this war is the concert party. Speaking for myself, and I know that many others felt the same, one of the greatest cravings that one had on active service, next perhaps to that for home life, was for music. I remember on Gallipoli, where we had none, this became acute. The system inaugurated later of having divisional and other concert parties did much to relieve this longing. In Egypt we were fortunate in having a most excellent concert party, sent out in 1916 under the auspices of Miss Lena Ashwell. Five or six good artistes with a first-rate repertoire went the round of the garrisons and camps carrying with them a breath of culture wherever they went. We had a visit from them at the Hospice where the big lounge formed an excellent concert hall.

Each of the divisions of our Corps during the spring of 1918 started a concert party, all of which were most successful. The members were excused other duties and gave themselves up to the business of providing entertainments. The 60th Division party, who called themselves the Barnstormers, were specially good. Recruited as it was in London, the 60th Division contained much musical and dramatic talent and the Barnstormers would have made a successful appearance before the most exacting audiences at Home. In particular they had one member, whose occupation in civil life was, I believe, that of a designer of theatrical dresses, who made up as a most bewitching *Bint*, as the young lady of Palestine is called, and who danced like a Pavlova.

One of the two Jewish battalions, raised in Palestine, but recruited from Jews all over the Empire, had in its ranks a first-rate violinist who gave us a performance on a never-to-be-forgotten occasion. Somehow the *Légende* of Wieniawski, played as it should be played by a little private soldier within sound of the enemy's guns amid all the bustle and strenuous life of war, was able to bring a thrill which does not come so easily in the Queen's Hall.

We do not know if the Romans who sacked Jerusalem in the year A.D. 70, had Legion Concert parties—probably not. But it is certain that the relaxation which ours brought was good for us, and that their humanizing influence must have counted for something when the time came to return to civil life.

The Ophthalmic Hospital in Jerusalem, built and endowed by the British Order of St. John, had been used by the Turks as a magazine. A terrific explosion there before our arrival had wrecked the place. The walls were cracked or thrown down and the whole building was a mass of twisted and exploded shell cases and cartridges. Many of these had not exploded so that it was by no means safe to climb about the ruins. In April Sir Courtauld Thomson, acting as Commissioner, visited Jerusalem to see about rebuilding and re-starting this hospital. With Sir Courtauld, I visited the hospital, which is picturesquely perched on a hilly promontory facing the western wall of Jerusalem, on the west side of the Valley of Hinnom. As a building it could never have been well adapted for the purpose of a hospital, but it had filled a great need in a city where eye disease is rife and it was decided to set about its restoration as nearly as possible on the old lines without delay. Plans were got out by an R.E. officer and the work was at once put in hand. By February 26, 1919, the repairs were completed and it was reopened by Sir Edmund Allenby in a quaint little ceremony, including a tea party, at which Sir Courtauld Thomson and Colonel Garner, Director of Medical Services for the Egyptian Government, were invested with the Order of Knight of Grace.

Another interesting piece of work carried out during the summer of 1917 was that of providing Jerusalem with a water supply. As already mentioned, Jerusalem was almost entirely dependent for its water supply on rain water stored in tanks and underground cisterns during the rainy months, for from April to October there is no rainfall. There is only one permanent source of water near Jerusalem, that known as the Virgin's Spring, which rises on the slopes of the hill to the south of the City and runs into the Pool of Siloam. This spring, so attractively described in the well-known hymn as "cool Siloam's shady rill," is so fouled with drainage from the city that it is quite unfit for human use. In the days of the Romans, or possibly as long before as the time of Solomon, a permanent supply had been brought by an aqueduct from some good springs in the hills twelve miles to the south of Jerusalem. The aqueduct started from a solidly built reservoir into which the springs were collected, and following

the contours of the hills by a winding route nearly forty miles in length, entered the city from the south. On its way it collected the water from a smaller series of springs, eight miles from Jerusalem, where there were three large reservoirs, known as the Pools of Solomon. When this supply was first brought we do not know. The only historical record about it is that given by Josephus in his *History*. He says: "Pontius Pilate undertook to bring a current of water to Jerusalem and did it with the Sacred Money and derived the origin of the stream from the distance of two hundred furlongs. However, the Jews were not pleased with what had been done about the water and many ten thousands of the people got together and made a clamour against him and insisted that he should leave off that design" (Josephus Antiquitus, Book XVIII, Ch. III, § 2).

The story goes on to relate that there was serious rioting which Pontius Pilate put down with great severity. Shortly after this, in consequence of complaints to Tiberius Cæsar of his severity in putting down another disturbance in Samaria, Pontius Pilate was recalled to Rome and lost his post.

Remains of the aqueducts can still be traced the whole way, but they have fallen into such disrepair that they are almost useless. An iron pipe still brought a small amount of water to the outskirts of Jerusalem from a point near Bethlehem where the existing aqueduct ends, but the supply from it was very small.

After we had been a few weeks in Jerusalem it became obvious that if the Army remained in the neighbourhood during the summer months it would quickly use up all the stock of water in the place and that there would be a water famine. It was decided, therefore, to re-establish the old Roman supply. It was necessary to clear and repair the old reservoirs near the springs and clean out the subterranean channels constructed in the old days connecting the springs with the reservoirs. A pumping station was constructed at the outlet of the lowest reservoir and connected by an iron pipe-line with a small new reservoir built on the hill about two hundred feet above the old one. A six-inch pipe line was then laid by the most direct route from the new reservoir to another small reservoir built on the high ground in the north-west suburbs of Jerusalem to which the water flowed by gravity. Pipes were laid from the Jerusalem reservoir to various parts of the city, including one to the German Hospice on the Mount of Olives. The work was put in hand by the Royal Engineers in April, 1918, and completed by June, so that by that month a good and sufficient water supply was ensured for the use of the troops and one which would be available for the city when the troops were withdrawn. This was a most creditable piece of work and did much to impress the inhabitants of the city with the business capacity of the new régime.

About fifty years ago the Baroness Burdett Coutts had offered to do this same piece of work for the benefit of the city at her own expense, but

the procrastination and greed of the Turkish officials had compelled her to withdraw her offer.

The civil administration of the city was left in the hands of the City Corporation under a military governor. Colonel Burton was the first Governor, but he was shortly afterwards succeeded by Colonel, now Sir Ronald, Storrs, of the Egyptian Government Service, who by his tact and knowledge of Eastern people and their ways established an equilibrium between the numerous conflicting interests—religious and racial—which make the management of Jerusalem so difficult and complex a business.

When we entered the city there was great shortage of food and the inhabitants were undergoing great privation. One of the first things to be done was to establish orphanages for the starving children. Some English ladies came up from Egypt and took over this work. An orphanage was opened by Miss Warburton in the Austrian Convent in the middle of the city. It was pathetic to see the half-starved children when they were first admitted, and most interesting to watch how their reserve thawed under kind and sympathetic care, and how their cheerfulness returned as their little bodies put on flesh. One little girl admitted there, aged 9, had already been twice married. Her first husband had divorced her and returned her to her parents and her second had been killed in the war. When this orphanage was in thorough working order, Miss Warburton took over a previously existing German orphanage in the modern part of Jerusalem, known as Talitha Kumi. It had been managed by deaconesses of the same Order as those who were at the Hospice, and who also managed the German Hospital. Just at this time an order came out from England that all these Sisters were to be sent down to Egypt to be interned. They bitterly resented being turned out of the orphanage and did their best to set the children against their successors. An unfortunate thing happened just before they left. The Sister-in-charge fell ill and died a few days before they had to leave and her death was not unnaturally put down to grief at having to leave. The German orphanage was afterwards converted into a High School for Girls. A staff of English mistresses was obtained from England, and with the assistance of some Syrian teachers, one or two of whom had been old pupils of Miss Warburton at Beirut, a most successful school was soon established. The girls were of all nationalities and creeds, Arabs, Jews, Greeks and Syrians. The opportunity for obtaining a first-class education was eagerly welcomed. The British Government did everything in its power to make it a success, and it soon became one of the most useful institutions in Jerusalem. The little Germanized orphans, however, proved very intractable. They had been thoroughly grounded in German ideas and in hatred for England, and gradually had to be eliminated from the school.

An interesting place in Jerusalem is the Leper Home, managed by German Moravian Sisters. It is a well-built, well-organized institution. The Sister-in-Charge had been there forty years. She told us when we

paid a visit that none of her staff had ever become infected, which proves the low infectivity of the disease. There was, however, an interesting example of the spread of the disease in family life, without heredity, in the fact that there were in the institute at the time of our visit a boy and his stepmother. All types of the disease were to be seen there, including some with horrible deformities.

(To be continued.)

Current Literature.

WELLS, D. H. Tuberculosis in Wild Voles. *Lancet*, May 22, 1937.

According to Griffiths, tuberculosis in warm-blooded animals living wholly in the wild state is unknown. Dr. Wells, however, reports a wide-spread occurrence of tuberculosis in voles—*Microtus agrestis*. These animals are subject to a cycle of population increasing for four years then decreasing suddenly, and Wells investigated the possibility of this sudden decrease being due to epidemic disease. He worked in the Bureau of Animal Population in the University of Oxford, and examined voles from areas in Scotland, Wales and England, which are uncultivated and fenced off from domesticated animals. On January, 1937, a vole died which had been in the laboratory for a little over one month. Caseous areas were found throughout the subcutaneous tissue of the body involving the glands in the inguinal region, axillæ and back. Both lungs contained caseous areas and the mediastinal and mesenteric glands were enlarged. The caseous material in the subcutaneous tissue contained acid-fast bacilli having the morphology of *Mycobacterium tuberculosis*. The caseous patches in the lungs also contained numerous acid-fast bacilli, but there was little cellular reaction. An emulsion of the caseous material was injected into other voles, guinea-pigs and rabbits. The disease was reproduced in the voles; three guinea-pigs died with wide-spread disease and acid-fast bacilli were present; large local lesions occurred in the rabbits. All the guinea-pigs and rabbits reacted to tuberculin one month after inoculation.

Since February, 1937, 134 voles have been found with tuberculous lesions. They arrived from seven different stations in the British Isles, and 92 of the infected voles arrived dead or were killed on arrival.

Though some facts about the bacterium are not yet known, Wells thinks it is probably *Mycobacterium tuberculosis*. If it proves to be so, he thinks the existence of tuberculosis in wild animals may have some importance in the spread of the disease to man and domestic animals. The use of an animal which contracts the disease naturally and is easily

maintained in captivity may help to throw fresh light on the epidemiological study of tuberculosis.

The organism is being typed by Dr. A. Stanley Griffith, of the Field Laboratories, University of Cambridge.

TORRES, C. M. Further Studies on the Pathology of Alastrim and their Significance in the Variola-Alastrim Problem. *Proc. Roy. Soc. Med.* 1936, v. 29, 1525-39 (Sect. Trop. Dis. & Parasit. 55-69). [45 refs.]

This lecture is a more detailed account of work that has already been published for the most part in a series of papers by the author in collaboration with Teixeira. [See *Bulletin of Hygiene*, 1933, v. 8, 407; 1934, v. 9, 241, 522; 1935, v. 10, 94, 302; 1936, v. 11, 161, 902.] The view which the author takes of the variola-alastrim problem is that we have to do with a single micro-organism which, according to circumstances not fully explained, gives rise to several different clinical and pathological conditions such as cowpox, variola and alastrim. Definite differences are noted in the shape, situation and staining properties of the cytoplasmic and intranuclear inclusion bodies in alastrim and smallpox or vaccinia when examined in malpighian cells. A differential histopathological diagnosis is rendered possible and has actually been made between alastrim and variola. It can be established upon the marked differences in the inclusion bodies themselves, and further, the common occurrence of giant epithelial cells and amitotic figures in alastrim, and, in a minor degree, the relatively small number of malpighian cells undergoing balloon degeneration in alastrim, as compared with variola. Paul's test can likewise be used for differential diagnosis, the reaction in alastrim being weak and inconstant and presenting a macroscopic picture unlike that considered typical for variola.

O. K. WRIGHT.

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MINISTRY OF HEALTH. Acute Poliomyelitis. Circular 1586, 1 p. 1936. December 30.

— **Acute Poliomyelitis.** Memo. 166/Med. Revised. 9 pp. 1936. London: H.M.S.O. [2d.]

The results of serum treatment of poliomyelitis are referred to and the opinion is expressed that much more experience of this remedy is necessary before its value can be appraised, but as the after-effects of the disease are so serious there may be some medical practitioners who still desire to use the serum. The collection and use of such human serum must for the present be a matter of arrangement between the medical practitioner and his patient, or for local organization. In England it is only through orthopaedic hospitals and other cripple institutions that the serum can be collected, and its preparation, testing for potency or toxicity, and storage

would have to be safeguarded. It is only through such institutions that convalescent serum has as yet become available (in London, Oxford, Birmingham and elsewhere), and a supply is not generally obtainable for practitioners on demand.

As regards attendance at schools, it is recommended that children in the affected household should remain away from school for a period of three weeks after isolation of the patient, and that residential schools be not closed. If a residential school is closed it is possible for the infection to be more widely distributed (not infrequently in homes with younger children).

In epidemic periods local authorities should endeavour to inform the public by means of leaflets, posters, notices in the Press, etc., how infection may be guarded against.

A. J. COLLIS.

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BULL. OFFICE INTERNAT. D'HYG. PUB. 1936, v. 28, 2361-4.

Expériences faite dans l'Inde Britannique sur la destruction des moustiques dans les aéroplanes. [Experiments in India on the Destruction of Mosquitoes in Aircraft].

Hicks and Chand, experimenting in the transport of living *Aedes* over great distances, handed cages containing mosquitoes to the commanders of aircraft flying from Karachi to Amsterdam. Female *Aedes* arrived alive at Amsterdam, and on the return voyage a certain number were still alive at Cairo, Baghdad and even Karachi. On the other hand 106 aircraft arriving at Karachi from Egypt, Damas and the Far East were searched and only once, in a machine from Jodhpur, was a mosquito found.

Sinton and Wats have found that the best insecticide spray is extract of pyrethrum which they have employed in the form of "Pyroicide 20," a standardized commercial product made in the U.S.A., containing 2 grammes of pyrethrines in 100 cubic centimetres, and, in use, diluted 1 part in 20 of kerosene.

If to the diluted extract of pyrethrum 5 per cent of essence of citronella or 0.5 to 1 per cent of essence of sassafras is added, the activity is slightly increased, no doubt principally by making the mosquitoes come out of their hiding places. Low temperature or high humidity diminishes efficiency and small adjustments of dosage are necessary. The solution will catch fire if sprayed over an open flame, but not in contact with a lighted cigarette. Spread over a wooden or stone floor the solution cannot be lighted with a match. Operators have regularly remained in the treated room up to thirty minutes. With concentrations of 2.5 to 3 cubic centimetres per 1,000 cubic feet there are no disagreeable effects; 5 cubic centimetres per 1,000 cubic feet is slightly oppressive.

Hicks and Chand have experimented with the same solution using laboratory-bred, young *Aedes aegypti*, enclosed in cages with gauze sides

placed in aeroplanes in various situations, preferably sheltered from the direct spray. They showed that the atomization must be extremely fine so that the mist does not fall to the ground. All spaces communicating with the fusilage, in some models even the interior of the wings, must be sprayed and openings even for greasing, inspection or repairs must be closed, otherwise leakage rapidly reduces the concentration. Sprays suitable for the treatment of houses were not satisfactory and a paint-spray working with compressed air at a pressure of 60 pounds to the square inch was employed.

Three cubic centimetres of Pyrocide 20, diluted to 60 cubic centimetres per 1,000 cubic feet, killed all mosquitoes in five minutes in the cabin, but fifteen minutes' exposure was necessary in more remote spaces and these doses have been prescribed for the treatment at Cairo or Alexandria of all aircraft *en route* to India from yellow fever infected regions.

Hicks and Chand have also experimented on the protection of aircraft from invasion by mosquitoes. Doors must fit tightly, but it is not possible for lack of space to instal "mosquito locks." Portable "mosquito-locks" should be wheeled up to suspected aircraft and fitted to the door so that passengers can disembark through the lock without risk of mosquitoes escaping.

Attention must be paid to mosquito-proofing of fittings in the cabin, of ventilators and of openings for lubrication, for access to internal structures, and for the passage of moving parts.

CHAS F. WHITE.

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ROYAL COLLEGE OF PHYSICIANS OF LONDON. **Domestic Heating by Gas considered from the Point of View of Health and Comfort.** Report of an Advisory Committee appointed by the College at the Request of the Governor of the Gas Light and Coke Company. [JAMESON, W. W., Chairman.] 31 pp. [44 refs.] 1936. December, London: Harrison & Sons, Ltd., 44-47, St. Martin's Lane, W.C. 2. [1s.]

This is the report of a Medical Advisory Committee, appointed with the approval of the Royal College of Physicians and at the request of the Governor of the Gas Light and Coke Company, to consider problems arising out of modern developments in the use of gas for domestic heating and of changes in methods of building construction, with special reference to the significance to health and comfort of the use of flueless gas appliances in rooms unprovided with flues or other devices which promote ventilation.

The Committee is of the opinion that the rate of air change in rooms under ordinary conditions of occupation has never been adequately investigated. There is good evidence that a flue of normal size promotes ventilation even without a source of heat at its base, but there is no general

agreement as to what constitutes sufficient ventilation in a room unprovided with a flue and dependent entirely on the opening of windows and doors for the ingress and egress of air. Until further evidence is forthcoming the Committee express the opinion that, wherever possible, living rooms should be provided with flues.

In view of criticisms which have been made concerning the use of flueless gas heaters, the effects on comfort and health of the inhalation of the products of combustion of coal gas are considered in detail. Data are given of the concentrations of carbon monoxide, sulphur oxides and nitrogen oxides that may be encountered in rooms heated by such appliances. It is recommended that concentrations of 0·0001 per cent of sulphur oxides, 0·0006 per cent of nitrogen oxides, and 0·005 per cent of carbon monoxide should not be exceeded: these limits are specified as avoiding smell whilst amply providing for hygienic purity. If the sulphur oxides do not exceed 0·0001 per cent the concentrations of carbon monoxide and the oxides of nitrogen will be insignificant.

It is assumed that a gas-rate of 1 cubic foot per hour per 100 cubic feet of room space is required to maintain comfortable warmth in cold weather. A rate of one cubic foot per hour per 50 cubic feet of room space, though permissible for intermittent use, would, if used continuously, lead to overheating and to the production of unpleasant sulphurous odours if the degree of ventilation were low and the sulphur content of the gas exceeded 10 grains per cubic feet. This overheating and the smell of sulphur oxides would ordinarily be intolerable long before the carbon monoxide concentration became significant.

A table is given showing the maximum gas-rates for 20-grain sulphur content gas burnt continuously in flueless heaters in rooms of 500 cubic feet capacity at which, with different rates of air-change, the resulting concentrations of products of combustion will not exceed the concentrations specified above. From these figures it appears that in such a room the number of cubic feet of gas burnt per hour should not exceed three times the number of air changes per hour. With a gas-rate of 5 cubic feet per hour, that is, the 1 cubic foot per hour per 100 cubic feet required in cold weather, 1·7 air-changes per hour are necessary. The report mentions that in flueless rooms of less than 1,000 cubic feet capacity an air-change of 1 per hour or more is commonly found, but in larger flueless rooms the air-change may fall as low as three-quarters per hour or even less. It follows, therefore, that if flueless gas-heaters are employed in flueless rooms care should be taken to ensure sufficient ventilation.

The effect of highly vitiated air on the process of gas combustion varies with different burners and gas appliances. In general, it is pointed out, a gas appliance may be relied upon to be satisfactory up to the maximum degree of vitiation which is likely to result from its normal operation. Combustion has been notably affected at degrees of vitiation which would occur under practical conditions only when the appliance has initially been

of unsatisfactory construction or when it has been operated at an excessive gas-rate. Satisfactory combustion is achieved by suitable design, by correct installation and maintenance of the appliance, and by the observance of the proper rate of supply of gas to the burners.

Cases of so-called "chronic carbon monoxide poisoning" have been attributed to the exposure at repeated intervals to concentrations of the gas insufficient to produce symptoms of acute poisoning, even when breathed over a long period. The available records and descriptions of alleged cases have been examined, and the Committee conclude that from the recorded evidence it is not possible to form a picture of any definite group of symptoms or signs, running any definite course, which can be recognized as the symptom complex of a chronic form of carbon monoxide poisoning. The Committee do not recognize as chronic carbon monoxide poisoning any of the usual after effects of acute or subacute poisoning from single or repeated toxic doses of the gas.

The interim report of the Committee is printed as an Appendix.

T. BEDFORD.

Reprinted from "Bulletin of Hygiene," Vol. 12, No. 4.

NATIONAL BUREAU OF STANDARDS. Penetration of Moisture into Masonry Walls. *Bur. Stand. T. N. B.* 1936 (234), 85-6. [Summary taken from *Dept. Scient. & Indust. Res. Building Sci. Abstr.* 1936, v. 9, 431-32.]

In continuation of tests of the rate of penetration of moisture through masonry walls, wallettes similar to those previously described are subjected to a test in which the water penetrates under the influences of capillarity and gravity only. Water was applied by means of a spray at the top of the wall, causing a continuous film of water on the exposed surface. Measurements were made of the time for dampness to appear on the unexposed surface of the wall, the time when leakage, if any, started, and the rate of leakage through the wall. After these tests, the walls were dried and again tested under conditions resembling exposure to heavy wind-driven rain, an air-pressure of 10 lb. per square foot being maintained on the exposed face. Water was again applied to one face of the wall near the top so as to produce a continuous film of water on the exposed surface. Some of the walls were also subjected to a third test in which water was applied by spray, while a difference in air pressure of 10 lb. per square foot was maintained between the exposed and unexposed faces, the intention being to simulate rain of moderate intensity accompanied by strong wind. As was expected, the rate of penetration of water was increased by maintaining the air pressure on the exposed face of the wall, the times at which dampness appeared on the unexposed faces being usually less than one-half of those required in the first test described. Similarly in the pressure-difference tests, leakage occurred sooner. It was also found that the behaviour of the walls was influenced by the quality of the workmanship in laying up the

brickwork, the wall thickness, and the type of brick unit employed. Of these factors, the quality of workmanship was the most important. All walls with open (unfilled) interior joints and flush-cut face joints leaked. Most of those with solidly filled interior joints and tooled face joints showed little or no leakage. None of these walls with solidly filled interior joints when built of hard impermeable bricks showed any leakage during the period of test (up to fourteen days), but all walls with unfilled interior joints leaked within five minutes from commencement of exposure. The effect of differences in workmanship was rather less pronounced for walls with bricks having higher absorptions. The quality of workmanship had a similar effect upon the behaviour of walls with a facing of bricks with fairly high absorption, and a backing of clay hollow blocks. Most of the data available are the results of the first two tests in which the water was applied at a rate greater than would result from ordinary rainfall. Walls with the more absorptive bricks have shown relatively better behaviour in the third tests in which the water was applied at a more normal rate. No important differences were observed in the performances of the walls built with various types of bricks but with completely filled and tooled joints. Each of the four cement lime mortars used was satisfactory and showed good working properties. Although the rate of penetration of moisture was rather less with walls laid up in cement-lime mortars containing a fairly high proportion of Portland cement than for those with a relatively high proportion of lime, the differences were too small to be of any significance.

Reprinted from "Bulletin of Hygiene," Vol. 12, No. 5.

FOX, L. A. **Field Chlorination of Water.** *Milit. Surgeon.* 1936, v. 78, 329-51. [Summary taken from *Pub. Health Engineering Abstr.*, Wash. 1937, Feb. 6, v. 17. Signed M. Le BOSQUEE, Jr.]

The author supervised a series of tests of methods of field chlorination using the canvas water sterilizing bag designed by Colonel Lyster. The purpose was to improve the methods and to obtain basic data for the revision of the procedure to take advantage of new stable high test hypochlorite made in America for the first time in 1927 (HTH and Perchloron). The work was done largely with Baltimore tap water artificially contaminated.

The conclusions are listed at the end of the article as follows:—
“(1) The germicidal action of calcium hypochlorite is very prompt. In our observation less than five minutes' contact time was required for the destruction of the intestinal Gram-negative bacilli when adequate residual chlorine was present. (2) Organic material interferes with the germicidal action of calcium hypochlorite more than any other factor that will normally be encountered in the purification of natural waters. (3) Suspended materials (turbidities) also interfere with the germicidal action of calcium hypochlorite. They appear to be much less important than

the organic content of the water. (4) In the absence of organic material and other agents utilizing the available chlorine, calcium hypochlorite is extremely bactericidal for the Gram-negative bacilli. In distilled water, purposely contaminated, these organisms are promptly destroyed when sufficient amounts of calcium hypochlorite are added to yield residual chlorine in quantities as low as 0.1 p.p.m. (5) Greater bactericidal action results from the direct addition of calcium hypochlorite than from the addition of a solution of hypochlorite even when the residual chlorine is the same. (6) The ortho-tolidine test does not measure the germicidal chlorine present. Residual chlorine readings obtained with this test in the presence of organic material and suspended solids do not indicate germicidal activity equal to that shown by the same readings in the absence of such interfering agents. (7) It is believed the above findings indicate that the present army practice of denying troops access to waters treated with calcium hypochlorite until thirty minutes have elapsed is not justified nor is the ortho-tolidine test in field practice a satisfactory control of the degree of chlorine required.

"It is recommended that regulations be revised to provide for a contact period of ten minutes after the addition of calcium hypochlorite to the water."

Reprinted from "Bulletin of Hygiene," Vol. 12, No. 5.

NEWCASTLE-UPON-TYNE, CITY AND COUNTY OF: A Study of the Diets of Sixty-Nine Working Class Families in Newcastle-upon-Tyne.
45 pp. [CHARLES, J. A., M.O.H.]

The food intake of sixty-nine working class families was determined for one week. In roughly half the families the bread-winner was employed, in the others the bread-winner had been unemployed for from six months to nine years. Trained investigators visited the houses, assisted in the measuring and weighing of food, estimating waste, etc. From the estimation of calories, proteins, fats, carbohydrates, Ca, Fe and P, it appeared very probable that the diets of the unemployed were as a whole inferior to those of the employed, and that large families had less adequate diets than small families. The unemployed consumed significantly less fat and animal protein than the employed. The calorific value of the diets appeared to be a rough measure of the total protein, fat, carbohydrate, P and Fe, but not of the animal protein or Ca. The consumption of fresh milk was low throughout, condensed skimmed milk being used instead. Condensed full cream milk was used by the employed more than by the unemployed. Cheap, nutritious foods like herring and rabbit were used hardly at all by any of the families. No relation could be found between hæmoglobin levels and iron content of family diets. Average Hb contents were 83 per cent in men and 73 per cent in women and children. Values below 70 per cent in men and 65 per cent in women and children were regarded as indicative of anæmia. There was a somewhat higher incidence

of anæmia among the unemployed (32 per cent of the women) than among the employed (10 per cent). [These Hb values were obtained using the Dare hæmoglobinometer. It is suggested that to convert these values to those given by the Haldane hæmoglobinometer (the one in general use), they should all be increased by approximately 10 per cent. Values below 80 per cent for men and 75 per cent for women would on this scale be indicative of anæmia.]

DOUGLAS C. HARRISON.

Reprinted from "Bulletin of Hygiene," Vol. 12, No. 5.

KAY, H. D. **Control of the Efficiency of Pasteurization of Milk: the Phosphatase Test.** *Canadian Pub. Health J.* 1936, v. 27, 551-54. [10 refs.].

The phosphatase test is described and discussed in relation to English requirements as to pasteurization, and its value in detecting small and large errors in the pasteurization process. The author then discusses its utility under requirements of time and temperature as permitted in Canada. He points out that the method loses a certain amount of its precision if it is applied to milk which has been held at a less temperature than 145° F. At the low temperature of 140° F. which is permitted in some parts of Canada it is less precise and less capable of detecting small errors. Since, however, most of the enzyme is destroyed in thirty minutes at 140° F. it is still capable of yielding valuable results with some modifications in the test. At 143° F. [there is no one uniform standard throughout Canada] it is of material value but with some loss of its extreme sensitiveness. The phosphatase test is also applicable to the control of the high-temperature short-time pasteurization process.

W. G. SAVAGE.

Reprinted from "Bulletin of Hygiene," Vol. 12, No. 5.

MORRIS, T. N. & BRYAN, J. M. **Second Report on the Corrosion of the Tinplate Container by Food Products.** *Dept. Scient. & Indust. Res. Food Investigation Spec. Rep. No. 44*, pp. vi + 54, 33 figs. [24 refs.] 1936. London: H.M.S.O. [1s.].

Apart from obtaining a method of lacquering which is perfect, the reduction of can corrosion is only possible by a detailed study of the various factors affecting corrosion, including consideration of the effects of storage under different conditions. This second report gives the results of a long series of such investigations, none of which supply a solution but many of which furnish useful suggestions as to possibilities of improving conditions. The chemical studies include the influence on corrosion of ferrous iron, of a stannic salt, small quantities of copper, the effect of sucrose and of sodium chloride. None showed any startling influence. The steel itself is subject to considerable variations as regards rate of corrosion both with different kinds of steel, and with the same kind, while there are even variations between specimens cut from the same sheet. One important result shown experi-

mentally was the powerful effect shown by sugar in decreasing the power of tin salts to inhibit the corrosion of steel and so reduce the percentage of hydrogen swells. This was shown over a considerable pH range. A study of the corrosion of steel by various fruit extracts showed considerable variations, extracts of cherry being the most active. Another series of experiments were carried out using a tin-iron couple, these giving somewhat similar findings.

From the chemical point of view there are very many factors to be considered and their influence varies with the pH, air access, temperature and their relationship to one another. To mention one factor as an example, sulphur dioxide in the presence of sucrose and invert sugars increases the corrosion of steel enormously (using a tin-iron couple), correspondingly decreasing the corrosion of tin, with marked increase in hydrogen production.

W. G. SAVAGE.

Reprinted from "Bulletin of Hygiene," Vol. 12, No. 5.

DENISON, G. A. **Epidemiology and Symptomatology of Staphylococcus Food Poisoning. A Report of Recent Outbreaks.** *Amer. J. Pub. Health.* 1936, v. 26, 1168-75. [17 refs.]

The main outbreak took place in March, 1936, in Birmingham (Ala.) mostly affecting high school students (94 cases), with 8 cases from cream puffs carried away from the school and 20 from cream puffs sold outside from the same bakery; 122 cases in all, with no deaths. The incubation period was mostly two to four hours, delayed in a few cases for six to eight hours. The symptoms were of the usual type with vomiting in 88 per cent and diarrhoea in 87 per cent. The vehicle was cream puffs all from one bakery. Only 57 per cent of those who ate this food were affected. The conditions at the bakery were indescribably bad in nearly every possible direction. Only one batch of cream filling was involved. It was supposed to be steam heated and then allowed to cool for two and a half hours. Nineteen cream puffs were examined and the bacterial count in at least some of them was 50 to 70 millions per gram, 90 per cent being *Staphylococcus aureus*. All the 19 strains studied were hæmolytic. Sterile filtrates were used for human volunteer experiments. Some persons were unaffected, mostly mildly ill, while one individual who took 10 cubic centimetres of the broth filtrate was "desperately ill for three hours."

Later in May, after the bakery had been cleaned up, it originated a second small outbreak of three cases. All had eaten of coconut custard pie, baked in this bakery, and consumed in different cafés. They were severely ill and had to be admitted to hospital. Portions of two pies contained enormous numbers of *Staphylococcus aureus*. Food poisoning in others who had eaten these pies could not be ascertained.

W. G. SAVAGE.

Reprinted from "Bulletin of Hygiene," Vol. 12, No. 5.

Reviews.

TEXTBOOK OF MEDICAL BACTERIOLOGY. By R. W. Fairbrother, D.Sc., M.D., M.R.C.P. London: William Heinemann (Medical Books), Ltd. 1937. Pp. viii + 437. Price 15s. net.

This is a first edition and the author is to be congratulated on presenting the subject so clearly and in such concise form. The science of bacteriology is developing so rapidly that it is becoming increasingly more difficult to embody the subject in a book of moderate size. This difficulty has been overcome, and this new book contains all the information likely to be required by the non-specialist reader. It can be recommended to those officers of the Corps who wish to be introduced to the subject prior to reading the more technical manuals. The illustrations are good and well chosen.

THE MAIN POINTS OF CHEMICAL WARFARE FROM THE MEDICAL ASPECT. By K. Shallcross Dickinson, M.R.C.S., L.R.C.P., Ph.C., etc. London: John Bale, Sons and Curnow, Ltd. 1937. Pp. 68. Price 1s.

The title of this small book is rather a misnomer, as it does not deal with chemical warfare from the medical aspect. It consists of a series of blank pages with tabulated headings of the various gases, aircraft, bombs and the respirator, designed, as the author explains, for annotation by students, for whose use the booklet is primarily intended.

To students working at this important subject the tables should be found useful, supplying suitable headings under which they can insert observations, notes, etc., from sources available to them.

THE HISTORY OF THE ACUTE EXANTHEMATA. By J. D. Rolleston, M.A., M.D., F.R.C.P., F.S.A. London: William Heinemann (Medical Books), Ltd. 1937. Pp. x + 114. Price 7s. 6d.

In this history of the acute exanthemata the author deals only with smallpox, chicken-pox, scarlet fever, measles, and German measles, leaving out enteric and typhus fever as he considers they are more suitably ranked by themselves in the class of continued fevers. He shows how it is only in comparatively late periods of their history that these acute exanthemata have been separated one from the other. Even in the Middle Ages epidemics of the acute exanthemata were generally regarded as of spontaneous development from unknown causes and as forerunners of some universal pestilence, only a subordinate part being attached to a contagion.

This little volume is full of interesting historical detail and should appeal greatly to students of the history of medicine.

A. G. B.

Notice.

SOME BRITISH SCIENTIFIC EXHIBITS AT THE PARIS INTERNATIONAL EXHIBITION, 1937.

THE scientific exhibits at the Paris International Exhibition are grouped in the Grand Palais (Champs Elysées) which has been incorporated as part of the Exhibition under the title "Palace of Discovery." Here exhibits from all parts of the world demonstrate scientific progress throughout the centuries. Sections are devoted to physics, chemistry, medicine and surgery, and to each of these important contributions have been made by the Wellcome Historical Medical Museum.

The section of physics is under the personal direction of Professor Jean Perrin, the Minister of Scientific Education and Research to the French Government. The Wellcome Historical Medical Museum has lent for exhibition its collection of Galvani's original apparatus with which he made his celebrated discoveries in connexion with animal electricity, the original Voltaic Pile first constructed by Alessandro Volta in 1800, as well as the original quadrant electrometer invented by Lord Kelvin, when Sir William Thomson. The Museum also exhibits a fine collection illustrating the historical development of spectacles with examples running from the fifteenth to the twentieth centuries. It also shows a comprehensive historical series of examples demonstrating the development of the microscope from the simple hand lens of the sixteenth century to the powerful instrument of modern times. Two further outstanding exhibits are the original microscope which belonged to Antoine Laurent Lavoisier, and the instrument which was once the property of J. T. Queckett, founder of the Queckett Microscopical Society. The simple instrument with which Anton van Leeuwenhoek conducted his pioneer work on micro-organisms is also illustrated in this collection.

In addition there are four dioramas which illustrate Sir William Crookes (1832-1919) experimenting in radio-electricity, Michael Faraday (1791-1867) experimenting in the laboratory of the Royal Institution, Evangelista Torricelli (1608-1647) who invented the barometer, and Roger Bacon (1214-1294) presenting one of his scientific works to the Chancellor of Paris University.

In the section of Chemistry there is an important exhibit relating to distinguished French chemists. Autograph letters, original manuscripts, historical apparatus, as well as many personal relics are shown. Amongst the distinguished scientists represented in this collection are C. L. Berthollet (1748-1822), J. B. Boussingault (1802-1887), M. E. Chevreul (1786-1886), J. B. Dumas (1800-1884), J. L. Gay-Lussac (1778-1850), Henri Moissan (1852-1907), and many other renowned chemists.

There are also three fine dioramas, one depicting a Mediæval alchemist

at work, one of the laboratory of the Hon. Robert Boyle (1627-1691), and one showing Antoine Lavoisier (1743-1794), with Madame Lavoisier, who collaborated with him, experimenting in his laboratory.

In the section of medicine there is a collection of stethoscopes, showing the development of the instrument from the time of its invention to the present day. The exhibit includes one of Laennec's original stethoscopes placed side by side with his rare work on auscultation in which the instrument was first described. Evolution in design is demonstrated by means of many examples. Interesting amongst the early specimens of the Laennec type is a stethoscope bearing the signature of Dr. Webster, the celebrated lexicographer. Another interesting contribution is an exhibit showing the evolution of the clinical thermometer. It comprises a large collection of examples of all periods of British and continental makes, including Aitken's original clinical thermometers, made by Cassella about 1865, which were then sold in pairs, one bent and the other straight. The first short self-registering clinical thermometer, designed by Sir Clifford Allbutt, is also shown. Another interesting feature is the collection of manuscripts, autograph letters, instruments, rare publications, etc., relating to eminent French physicians. A fine diorama depicts the famous French physician Laennec pursuing his clinical researches at the Hospital Necker, which resulted in his invention of the stethoscope.

In the section of surgery there is a unique exhibit illustrating the history of the transfusion of blood. It is interesting to see in this exhibit transcriptions from the Diary of Samuel Pepys, giving his impressions of experiments which he witnessed. By apparatus, including a model of that first used by Richard Lower, and by diagrams, the whole history of the transfusion of blood is well demonstrated. A collection of exhibits illustrating the history of anæsthesia is to be seen in the subsection devoted to this subject. Historical apparatus from the time when Dr. Henry H. Hickman first discovered the possibilities of inducing suspended animation by inhalation as an aid to surgical operation is exhibited. Apparatus used in 1846 by Dr. W. T. G. Morton for administering ether, and Peter Squire's anæsthetic apparatus, are shown. An interesting selection of subsequent types of anæsthetic apparatus is shown together with a fine collection of portraits of the principal pioneers connected with the advancement of this branch of surgical practice. In the section dealing with antiseptic surgery is a diorama depicting Lord Lister performing a surgical operation under the early antiseptic conditions which he had himself devised. A bust of Lord Lister is also shown.

These exhibits from the Wellcome Historical Medical Museum have met with the generous appreciation of the French Government, who, as it will be remembered, conferred two years ago upon the late Sir Henry Wellcome, LL.D., D.Sc., F.R.S., the Cross of Officer of the Legion of Honour, a distinction with which he was personally decorated by the President of the Republic.

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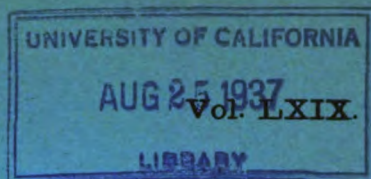
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Journal of the Royal Army Medical Corps.

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THE PRINCIPLES OF ADEQUATE ARTIFICIAL ILLUMINATION.

BY MAJOR J. BIGGAM, M.C.,
Royal Army Medical Corps.

A SHORT investigation into the adequacy and suitability of artificial illumination in Army buildings has just been completed.

It is thought that the methods adopted in such an investigation and the general principles of good lighting involved will be of sufficient interest to warrant publication.

Good lighting is as much a part of good hygienic conditions as pure air and food, good ventilation and proper sanitary arrangements.

Lighting conditions which strain the eyes accentuate the difficulties of work, or pave the way for accidents, or are psychologically depressing, and require attention equally with other defective hygienic surroundings.

APPARATUS FOR MEASURING ILLUMINATION.

An apparatus for measuring illumination consists, in its simplest form, of two identical white surfaces so arranged that they can be compared together. The first is placed at the point where the illumination is to be measured, and receives on it all the light incident at that point; the second is illuminated to any desired and known amount by some source of light under control. When the brightness of this second surface matches the first one, its illumination, being known, is a measure of the unknown illumination at surface I.

The various instruments used in practice merely differ in the methods adopted for adjusting the illumination at surface II, and also in the devices employed for conveniently comparing the two surfaces together.

Such photometers, involving comparison between an unknown light intensity and a standard light intensity, require some skill to secure accurate results.

Also the readings take time, and further, the accumulator or other source of energy used to illuminate surface II requires careful attention.

Within the limits of intensity of illumination and of accuracy with which we are ordinarily dealing in measurements of house and barrack lighting, it will be found much more convenient and more rapid to use one of the several illumination meters now on the market, where light intensity is measured directly without any comparison with standards and the surface intensity in foot-candles is given directly by the deflection of the pointer of a delicate micro-ammeter actuated by the current from a photo-electric cell. No batteries or any auxiliary apparatus is required. Light energy falling on the photo-electric cell is transformed into electrical energy and this actuates the micro-ammeter, the intensity of illumination falling on the cell being read off directly in foot-candles.

Most of the meters of this type are calibrated for tungsten light, but when it is desired to measure other types of illumination suitable correction factors are available, or suitable filters can be added.

Simple meters of this type can be obtained for less than £4, but these are not sufficiently sensitive for reasonably accurate work.

More sensitive and accurate meters costing from £20 to £50 or more are available, and are quite satisfactory for the type of investigation normally undertaken.

METHOD OF MEASUREMENT AND INSTRUMENT EMPLOYED.

The inspections were not begun until an hour of the evening when daylight interference was negligible.

When possible, illumination was measured at table level, or on the plane of the work.

Before readings were taken lamps were fitted according to "Barrack Schedule" standard of lighting.

The readings taken, therefore, did not represent the conditions usually prevailing, but those which would be found if authorized lighting installations were in use.

The instrument employed was the Holophane-Edgcombe Auto-photometer Model III triple range scale with ranges of: (a) 0 to 2.5; (b) 0 to 10; (c) 0 to 50 foot-candles. This is a photo-electric cell instrument with a sensitive micro-ammeter, and is calibrated for filament electric lamps. The manufacturers quote its percentage accuracy as well within a limit of 10 per cent.

This instrument is now kept in the Hygiene Department of the Royal

Army Medical College, Millbank. It can be obtained on loan, on application to the Commandant, Royal Army Medical College, if required for the purpose of investigating illumination.

HISTORICAL.

The resinous torch, the rushlight, and the primitive candle date back to antiquity, and the open saucer oil lamp in use in India to-day was known at Ur of the Chaldees six thousand years ago.

The open saucer oil lamp, however, was in use in the Shetland Islands until quite recently.

By the end of the eighteenth century the Argand burner had appeared, and the use of mineral oils, with their high volatility, led to rapid advances in oil lighting by the middle of last century.

Gas lighting became a practical method of illumination in the eighteenth century, and passed through the early stages of the open tube burner, the batswing and the fishtail, until one hundred and thirty years ago the first street—Pall Mall—was lit by gas.

It was not, however, until the Welsbach mantle was introduced in 1893 that gas as an illuminant really came into its own.

The electric arc was demonstrated over a century ago, but the first successful carbon filament lamp of Swan and Edison is only some sixty years old.

And so, through many stages, to the tungsten vacuum lamp, the coiled filament gas-filled lamp, and the coiled coil lamp of three years ago.

At the moment luminous discharge tubes, now used extensively in industrial and street lighting, with efficiencies up to about sixty lumens per watt (compared with 3·5 of the carbon filament lamp), appear to be advancing rapidly into favour, and with further improvements to come are likely to be used to an even greater extent in the future.

For example, the high pressure mercury vapour electric discharge lamp (which has no filament as in the ordinary gas-filled lamp, but gives light by means of an electric discharge through one or more gases contained in an inner tube surrounded by a vacuum jacket) gives about two and a half times as much light as the same size of filament lamp.

Its colour characteristics (the spectrum of this lamp is not continuous, being a line spectrum composed of green, some blue and a little red, giving a greeny-blue light) are a disadvantage for some forms of lighting; but this defect is likely to be eliminated.

As a matter of interest some approximate efficiencies of light sources in lumens per watt are given:—

Carbon filament lamps	..	..	..	..	3·5
Tungsten filament lamps (vacuum)	..	..	..	..	8·0
Tungsten filament (gas filled) low wattage	..	..	..	..	11·0-15·0
Arc lamps	..	..	..	..	20·0
Hot cathode (luminous discharge) lamps—mercury	..	..	..	..	45·0
“ “ “ “ “ “ sodium	..	..	..	..	55·0

DEFINITION OF TERMS USED IN PHOTOMETRY AND ILLUMINATION.

Light.—Light may be defined as radiant energy in a form capable of being appreciated by the human eye, i.e. in a form capable of evoking the sensation of vision.

A light source emits luminous energy continually in all directions, and the rate of emission of energy is termed the amount of flux emitted by the source.

Luminous flux.—Luminous flux is the rate of passage of radiant energy evaluated by reference to the luminous sensation produced by it. Although luminous flux should be regarded, strictly, as the rate of passage of radiant energy as just defined, it can, nevertheless, be accepted as an entity for the purposes of practical photometry, since the velocity may be regarded as being constant under these conditions.

Luminous Intensity.—The luminous intensity (candle power) of a point source in any direction is the luminous flux (light) per unit solid angle emitted by that source in that direction.

Unit solid angle = the solid angle subtended at the centre of a sphere by an area on the spherical surface equal to the square of the radius.

Unit of Luminous Intensity (The International Candle).—The unit of luminous intensity is the international candle, as agreed by the three national standardizing laboratories of France, Great Britain and the United States of America in 1909. This unit has been maintained since then by means of electric incandescent lamps in these laboratories, which are entrusted with its maintenance.

The standard candle is made from sperm wax, is prescribed to be of a certain weight, burns 120 grains spermaceti per hour, and emits a light of one candle power.

Candle Power.—The term which has been most commonly used in the past to express the light-giving power of a source is candle-power. This word, including as it does the name of the unit, is not altogether satisfactory as a general expression for the quantity itself. It is, therefore, preferable to use the term luminous intensity where no actual measure is involved, and to reserve the word candle-power for luminous intensity expressed in international candles. Thus the statement that the candle-power of a lamp is 16 is equivalent to the statement that its luminous intensity is 16 international candles. A 16 c.p. lamp is an abbreviated form of expression which is often used.

Unit of Luminous Flux (or quantity of light).—The unit of luminous flux is the lumen. It is equal to the flux (quantity of light) emitted in unit solid angle by a uniform point source of one international candle. In other words it is the quantity of light required to illuminate one square foot to the intensity of one foot candle.

The total flux emitted from a uniform light source of one candle is 12.57 lumens.

Illumination.—When luminous flux reaches a surface, that surface is said to be illuminated, and the illumination at any point of it is thus defined: the illumination at a point of a surface is the density of the luminous flux (light) at that point, or the quantity of light per unit area.

Unit of Intensity of Illumination.—The now accepted unit of intensity of illumination in this country is the foot-candle. One foot-candle may be defined as the illumination produced by a light source of one standard candle at a point on a surface one foot from a source, and so placed that the light rays from the source strike the surface at right angles. In other words one foot-candle illumination means that each square foot of the surface is receiving one lumen of light.

Average Illumination.—The average illumination of any area is equal to the total luminous flux it receives, expressed in lumens, divided by the area in square feet.

Brightness.—The brightness of a surface results from the quantity of light or luminous flux it emits, either by virtue of its self luminosity (e.g., a direct light source) or by the reflection of some of the light it receives from luminous sources. This leads to the following definition: The brightness in a given direction of a surface emitting light is the quotient of the luminous intensity measured in that direction by the area of this surface projected on a plane perpendicular to the direction considered.

The unit of brightness is one candle per unit area of surface.

In short "surface brightness" is measured by the amount of light returned from a surface (or part of a surface) "illumination" by the amount of light received on it.

If a 5-foot candle illumination falls on white paper which reflects 80 per cent., the brightness of the surface will be four apparent foot-candles.

It will be noted, therefore, that a small light source of high surface brightness can be converted to a larger source of low surface brightness, with the loss of a small percentage of luminous flux, by a suitable diffusing globe. This is a very important practical point in the elimination of glare, etc., in illumination design.

The brightness of the sun is approximately 165,000 candles per square centimetre. The filament brightness of a 100-watt gas-filled lamp is about 650 candles per square centimetre. Pearl and opal lamps have been produced to reduce the effects of glare. The pearl lamp has the interior of its bulb acid etched, and gives as a result a surface brightness of eight candles per square centimetre with a loss of light of only $1\frac{1}{2}$ per cent. The bulb of the opal lamp is formed of two skins, the inner of clear glass and the outer of a thin layer of dense opal glass. The light absorption is in the region of $7\frac{1}{2}$ per cent. The brightness of a 100-watt opal bulb is about $1\cdot7$ candles per square centimetre.

Reflection Factor.—The ratio of the flux reflected by a body to the flux incident upon it.

Absorption Factor.—The ratio of the flux absorbed by a body to the incident flux.

Transmission Factor.—The ratio of the flux transmitted to the incident flux.

Depreciation Factor.—This is a factor which allows extra initial illumination to compensate for the failing off in reflecting efficiency of the reflectors (such as walls and ceilings), due to deterioration and the collecting of dirt and dust, and also to the ageing of the lamps. (A drop of 30 per cent is usually allowed.)

Diffusers.—A class of transmitting substances such as opal glass, ground glass, &c., by which the incident light is so scattered by internal reflections of minute particles within the substance of the body, or on its surface, that the emergent light is more or less evenly distributed. A perfectly diffusing surface appears equally bright whatever be the direction from which it is viewed. The brightness of such bodies may be expressed in candles per square inch or other unit area.

Efficiency.—The efficiency of a source of light is defined as the ratio of the total luminous flux it emits to the total power it consumes. The latter quantity is usually expressed in watts.

A *direct system of lighting* is one in which the greater part of the luminous flux emitted reaches the working plane directly without any intermediate reflection.

An *indirect system* is one in which most of the flux is directed upwards to the ceiling, and is thence reflected to the working plane.

A *semi-indirect system* is one in which part of the flux reaches the working plane directly and part reaches it by reflection from the ceiling, or from some other object external to the source.

Inverse Square Law.—The illumination of a surface is inversely proportional to the square of its distance from the source illuminating it. This is, of course, a fundamental law in photometry and of paramount importance in practical illumination.

Depreciation Factors.—There are at least three factors which cause a progressive diminution in the illumination in a given room :—

- (1) The accumulation of dust or dirt on the glassware of lighting fittings.
- (2) Depreciation of the reflecting value of the walls and ceiling due to the accumulation of dust and dirt.
- (3) Deterioration of the illuminants themselves.

Experience shows that these causes may reduce the illumination by 20 or 30 per cent. of its initial value in six weeks, if local conditions are sufficiently unfavourable.

These factors of depreciation should therefore be taken into account when the installation is initially planned, in order that the minimum values of illumination recommended may be obtained when the depreciation conditions are at their worst.

STANDARDS OF ILLUMINATION FOR COMPARISON.

The eye is a very adaptable organ. It will function to some extent in ordinary visual tasks in illuminations varying from $\frac{1}{2}$ to 10,000 foot-candles, but, by attempting to exceed its limits of adaptability, demands are made upon physical and nervous vitality which may exhaust human reserves.

When the light is adequate and suitable, the visual apparatus can function without strain.

Standards of illumination have varied, and are varying greatly with the passage of time, the modern tendency being a very definite and rather rapid rise in values.

Eighteen years ago a standard textbook on illumination quoted 2 to 3 foot-candles as a desirable intensity of lighting for reading and writing, and in 1911 the Joint Committee of the Illuminating Engineering Society recommended for school lighting a minimum illumination of 2 foot-candles on the plane of the work for ordinary reading and writing and of 4 foot-candles for special work (drawing, etc.). These figures may be compared with the present recommended values for the same types of work, quoted elsewhere.

Light to-day costs probably one-fortieth of what it did forty years ago, but equally probably forty times as much is used.

Improved lighting has been stimulated by easier and cheaper methods of light production, and by the very marked increase in the efficiency of lamps.

Although the eye cannot function efficiently with insufficient light, at the same time to provide light of more than adequate intensity, even if in a suitable form, is wasteful and may also be unpleasant in its effects.

The subjects of vision and of illumination have been studied by various workers under the Medical Research Council.

A number of aspects of illumination, as related to vision, have been studied, and are the subjects of reports to the Department of Scientific and Industrial Research.

Illumination is treated in Home Office reports, Welfare pamphlets, etc.

The National Physical Laboratory Photometry Department is in constant touch with the subject.

The Electric Lamp Manufacturers Association maintains a showroom and laboratory and a permanent exhibition for the purpose of demonstrating the advantages to be gained by improved lighting.

The Illuminating Engineering Society exists for the purpose of providing a common meeting ground for all interested in lighting, illuminating engineers, architects, suppliers, contractors and consumers. It numbers among its members and upon its committees representatives of medical, industrial and physical interests, as well as light and lighting appliance sellers. The reports of its committees are accepted as utilitarian standards satisfying medical and physical requirements and justifying their cost to the user.

The first and most essential point in an investigation concerning illumination values is to establish what may be accepted as reliable modern standards of adequate illumination for various visual tasks.

In the course of this investigation I consulted a number of authorities who endorsed my decision to take as present-day acceptable standards the "Recommended Values of Illumination" prepared by the Technical Committee of the Illuminating Engineering Society and published in their *Transactions*, Volume I, No. 3 of March, 1936.

One of the authorities consulted stated: "The Illuminating Engineering Society's recommended values may certainly be taken as representative of ordinary good practice at the present time, and anything markedly lower than these must be regarded as out of date and unsatisfactory."

Another authority said: "The values quoted may appear excessive, but I think there is no doubt that they reflect the general trend of illumination. Many installations with these high values can be found to-day and my own opinion is that, with the development of discharge tubes, even higher illuminations will be used in about ten years time."

With the permission of the Illuminating Engineering Society extracts of the "Recommended Values of Illumination" (revised version) approved by their Council in May, 1937, and shortly to be published, are reproduced here.

RECOMMENDED VALUES OF ILLUMINATION.

(Revised Version.)

The following "Recommended Values of Illumination," prepared by the Technical Committee of the Illuminating Engineering Society as an indication of good modern lighting practice, have been recently revised and extended.

(a) This code gives *recommended illumination values* on the working plane for various classes of work based upon good modern practice.

It is recognized that these recommendations will require revision from time to time in order to take cognisance of new investigations and changes in practice.

(b) *Service Values of Average Illumination.*—The values given are service values of average illumination within the area over which the visual task is carried out. Where there is no definite area of work the illumination values are assumed to be available on a horizontal plane 2 feet 9 inches from the floor. The illuminating engineer must make allowances for depreciation. In practice the initial values of illumination should be higher than the service values it is desired to provide.

(c) *Supplementary Local Lighting.*—The higher values may be obtained by supplementing the general lighting with local lighting, but the method of providing these illumination values is not specified, as this is a matter for the judgment of the illuminating engineer.

(d) *Uniformity of Illumination.*—These recommended values assume that there will not be undue variation in the values of illumination over the working area. In general it is considered that no point of the working area shall be illuminated to less than 70 per cent of the maximum.

(e) *General Classification of Visual Tasks.*—Accompanying the code is a general classification of visual tasks together with the recommended illumination for adequate seeing conditions.

This classification forms the basis for the allocation of illumination values given in the table of specific tasks and, in the case of visual tasks outside those enumerated, provides a means of estimating the illumination required.

Present knowledge relating to seeing does not permit a precise statement of the illumination required for any visual task to be given, and the Committee have accordingly recommended ranges of illumination consistent with present good practice.

(f) *Colour Correction.*—Instances also arise in which the colour of the light as well as the provision of adequate illumination is an important condition.

VALUES OF ILLUMINATION RECOMMENDED AS ADEQUATE FOR VARIOUS TASKS.

<i>Recommended Foot-candle Value</i>	<i>Class of Task.</i>
1. Above 50	Precision work to a high degree of accuracy ; tasks requiring rapid discrimination ; displays.
2. 25—50	Severe and prolonged visual tasks, such as fine engraving, discrimination or inspection of fine details of low contrast.
3. 15—25	Prolonged critical visual tasks, such as drawing, fine assembling, fine machine work, proof reading, sewing on dark goods, and typesetting.
4. 8—15	Visual tasks such as detailed office work, skilled bench work, sustained reading and sewing on light goods.
5. 5—10	Less exacting visual tasks, such as in classrooms and general offices ; casual reading and large assembly work.
6. 3—5	Work of simple character not involving close attention to fine detail.
7. 2—4	Casual observation where no specific work is performed.

RECOMMENDED ILLUMINATION VALUES.

GENERAL.

<i>Dentists' Surgeries.</i>							<i>Foot-candles</i>
Surgeries (chair) .. .. .	..	..	..	..	..	..	25—50
Waiting rooms .. .. .	..	..	..	..	..	..	5—10
<i>Homes.</i>							
Bathrooms—							
General .. .. .	..	..	..	..	..	..	5—10
Mirrors .. .. .	..	..	..	..	..	..	<i>Special Lighting</i>
Bedrooms—							
Beds and mirrors .. .. .	..	..	..	..	..	..	<i>Special Lighting</i>
General .. .. .	..	..	..	..	..	..	3—5
Kitchens—							
Cookers, sinks, and tables .. .. .	..	..	..	..	..	..	5—10
Nurseries .. .. .	..	..	..	..	..	..	5—10
Reading—casual .. .. .	..	..	..	..	..	..	5—10
Reading—sustained .. .. .	..	..	..	..	..	..	8—15
Sewing .. .. .	..	..	..	..	..	..	15—25
Students' homework .. .. .	..	..	..	..	..	..	8—15
Table games .. .. .	..	..	..	..	..	..	5—10
Workbenches .. .. .	..	..	..	..	..	..	8—15
<i>Hospitals.</i>							
Beds .. .. .	..	..	..	..	..	..	<i>Special Lighting</i>
Corridors and stairways .. .. .	..	..	..	..	..	..	2—4
Laboratories .. .. .	..	..	..	..	..	..	15 25
Operating rooms .. .. .	..	..	..	..	..	..	15—25
Operating tables*	100—500
Private rooms and wards	2—4
Receiving and waiting rooms	5—10

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RECOMMENDED ILLUMINATION VALUES. GENERAL—continued.							
<i>Hotels.</i>							<i>Foot-candles</i>
Bakeries .. .. .	..	..	..	..	..	..	5—10
Bedrooms—							
Beds and mirrors .. .. .	..	..	..	..	..	..	<i>Special Lighting</i>
General .. .. .	..	..	..	..	..	..	5—10
Corridors and stairways .. .. .	..	..	..	..	..	..	2—4
Dining rooms and lounges .. .. .	..	..	..	..	..	..	5—10
Writing rooms—							
General .. .. .	..	..	..	..	..	..	5—10
Tables .. .. .	..	..	..	..	..	..	<i>Special Lighting</i>
<i>Offices (including Banks).</i>							
Book-keeping and typing rooms .. .. .	..	..	..	..	..	..	8—15
Corridors and stairways .. .. .	..	..	..	..	..	..	2—4
Drawing offices .. .. .	..	..	..	..	..	..	25—50
General offices and private offices .. .. .	..	..	..	..	..	..	5—10
<i>Public Buildings.</i>							
Libraries—							
Backs of books .. .. .	..	..	..	..	..	..	2—4
Book rooms .. .. .	..	..	..	..	..	..	5—10
Corridors and stairways .. .. .	..	..	..	..	..	..	2—4
Reading rooms .. .. .	..	..	..	..	..	..	5—10
Public Halls—							
Corridors and stairways .. .. .	..	..	..	..	..	..	2—4
General interiors .. .. .	..	..	..	..	..	..	5—10
<i>Schools.</i>							
Art and drawing rooms .. .. .	..	..	..	..	..	..	15—25
Classrooms, libraries and offices .. .. .	..	..	..	..	..	..	5—10
Corridors and stairways .. .. .	..	..	..	..	..	..	2—4
Dressing rooms, toilet and wash rooms .. .. .	..	..	..	..	..	..	5—10
Gymnasiums .. .. .	..	..	..	..	..	..	5—10
Laboratories .. .. .	..	..	..	..	..	..	8—15
Lecture theatres .. .. .	..	..	..	..	..	..	5—10
Manual training rooms .. .. .	..	..	..	..	..	..	8—15
Sewing rooms .. .. .	..	..	..	..	..	..	15—25
<i>Shops (including Restaurants and Stores).</i>							
Bakeries .. .. .	..	..	..	..	..	..	5—10
Corridors and stairways .. .. .	..	..	..	..	..	..	2—4
Dressing rooms, toilet and wash rooms .. .. .	..	..	..	..	..	..	5—10
Large departmental stores .. .. .	..	..	..	..	..	..	15—25
Refreshment rooms .. .. .	..	..	..	..	..	..	5—10
Restaurants .. .. .	..	..	..	..	..	..	5—10
Shops.. .. .	..	..	..	..	..	..	8—15
<i>Sports (including Indoor Recreations).</i>							
Billiards—							
General .. .. .	..	..	..	..	..	..	2—4
Tables .. .. .	..	..	..	..	..	..	15—25
Gymnasiums .. .. .	..	..	..	..	..	..	5—10
INDUSTRIAL.							
<i>Assembly Shops.</i>							<i>Foot-candles</i>
Extra fine work .. .. .	..	..	..	..	..	..	25—50
Fine work .. .. .	..	..	..	..	..	..	15—25
Medium work .. .. .	..	..	..	..	..	..	8—15
Rough work .. .. .	..	..	..	..	..	..	5—10
<i>Burnishing and Polishing</i> .. .. .	..	..	..	..	..	..	8—15
<i>Cloth Cutting, Inspecting and Sewing.</i>							
Dark goods .. .. .	..	..	..	..	..	..	15—25
Light goods .. .. .	..	..	..	..	..	..	8—15
<i>Drawing Offices</i> .. .. .	..	..	..	..	..	..	25—50
<i>Garages.</i>							
General .. .. .	..	..	..	..	..	..	5—10
Repair department .. .. .	..	..	..	..	..	..	8—15

RECOMMENDED ILLUMINATION VALUES. INDUSTRIAL—continued.

Inspection (Colour of light according to requirements).								Foot-candles
Extra fine	..	..	..	..	..	..	..	25—50
Fine	..	..	..	..	..	..	..	15—25
Medium	..	..	..	..	..	..	..	8—15
Rough	..	..	..	..	..	..	..	5—10
<i>Machine Shops.</i>								
Extra fine bench and machine work	..	..	..	..	..	..	..	25—50
Fine automatic machines, fine bench and machine work, fine buffing and polishing, and medium grinding	..	..	..	..	..	..	..	15—25
Medium bench and machine work, medium buffing and polishing, ordinary automatic machines and rough grinding	..	..	..	..	..	..	..	8—15
Rough bench and machine work	..	..	..	..	..	..	..	5—10
<i>Paint Shops.*</i>	5—10
<i>Sheet Metal Works.</i>								
Fine bench work, miscellaneous machines, ordinary bench work, presses, punches, shears, stamps and welders	..	..	..	..	..	..	..	8—15
Tinplate inspection	..	..	..	..	..	..	..	15—25
<i>Shoe Manufacturing.</i>								
Cutting, hand turning, lasting and welting, miscellaneous bench and machine work	..	..	..	..	..	..	..	8—15
Inspecting and sorting	..	..	..	..	..	..	..	15—25
Stitching	..	..	..	..	..	..	..	25—50
<i>Smiths' Shops.</i>								
Fine forging and welding	..	..	..	..	..	..	..	5—10
Rough forging	..	..	..	..	..	..	..	3—5
<i>Stores.</i>								
Heavy	..	..	..	..	..	..	..	2—4
Light	..	..	..	..	..	..	..	5—10
<i>Testing.</i>								
Extra fine instruments, scales, etc.	..	..	..	..	..	..	..	25—50
Fine	..	..	..	..	..	..	..	8—15
Rough	..	..	..	..	..	..	..	5—10
<i>Warehouses..</i>	..	..	..	..	..	..	..	2—4
<i>Welding</i>	..	..	..	..	..	..	..	8—15
<i>Woodworking.</i>								
Cooperage, glueing, medium machine and bench work, planing, rough sanding, sizing, and veneering	..	..	..	..	..	..	..	8—15
Fine bench and machine working, fine sanding and finishing	..	..	..	..	..	..	..	15—25

* Installations where artificial daylight may be useful.

With regard to the above extracts it will be noted that these recommended values: (a) Are Service values of average illumination on the working plane without allowances for depreciation. (b) Assume that there will not be undue variation in the values of illumination over the working area—no point of the working area being illuminated to less than 70 per cent of its maximum.

With regard to the adequacy of the standards of illumination to be accepted it is to be remembered that the work of the Army in these days of specialization and mechanization is of an accuracy and intensity unknown in bygone days; also a higher standard of general comfort is expected by the soldier, both at his work and in his leisure hours.

In recent years light values have risen fairly rapidly in civil life, and Army lighting will almost certainly require review.

(To be continued.)

ANTIMALARIA REPORT UPON THE PROPOSED CANTONMENT SITE AT KAU LUNG TSAI.¹

By MAJOR M. R. BURKE,
Royal Army Medical Corps.

(Continued from page 15).

D.—THE SITUATION WITH REGARD TO THE EXISTING CHINESE POPULATION RESIDING IN THE AREA.

The Chinese population living in or near the cultivated areas is very much denser than would appear from the map—numerous Chinese dwellings, particularly of the mat-shed type, are not shown thereon.

Some of these primitive habitations spring up like mushrooms overnight—squatters erect mat-sheds in areas that have been taken over by the Colonial Government prior to reclamation, and from which the former inhabitants have moved to settle elsewhere, often in the immediate vicinity, thus increasing the density of population in an adjacent locality.

Recently reclaimed land is frequently cultivated with catch crops, until such time as it is required for building purposes. As a result an inevitable increase in Culicine breeding takes place, consequent on the construction of sumps, shallow wells, etc., by the cultivators.

In the more compact Chinese villages such as Po Kong, Chuk Un, Ta Ku Ling, etc., the houses are usually built of stone or brick and roofed with tiles, but the dwellings are huddled together, and the hygienic standard is generally low.

There is a very old Chinese walled village at Nga Tsin. This village is surrounded by a moat containing foul, stagnant water.

The area embracing old Kowloon City, and the district situated east of it, is a veritable human warren. The dwellings in this locality are built of stone or brick, but they are for the most part packed close together, with but narrow alleys between them in lieu of streets—the whole constituting most insanitary areas.

The Kowloon City referred to above is the old walled city of Kowloon—it is shown on the map and should not be confused with the modern Kowloon City, which adjoins Kai Tak, on the west side.

The Chinese in the cultivated areas, apart from those living in the villages referred to above, reside for the most part in habitations of the mat-shed type.

Open concrete pits, containing human excreta, and frequently leaking, are to be found every few yards in the cultivated areas. Human excreta

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is stored in these pits, until such time as it is required for fertilizing tracts of cultivation both wet and dry.

The Chinese obtain the water necessary for their crops from sumps, shallow wells, irrigation ditches and streams; such water is heavily polluted by leakage from the adjacent pits, and by buckets used indiscriminately for drawing water and carrying human excreta.

Culicines breed abundantly in these cultivated areas, and although it is outside the purview of this report, it should be noted that flies are also very numerous.

It must be remembered that whatever form of training and concreting of streams, and reclamation, is adopted, provision will have to be made to preserve the irrigation rights of the Chinese in the area.

It is considered that however efficiently the area is drained, a mosquito nuisance, caused by culicine breeding in the cultivated areas, is inevitable, unless steps are taken to supply the Chinese with water in such a way that mosquito breeding will not in consequence be encouraged, and to ensure that cultivated areas are kept under constant and skilled supervision.

A method has been devised for conserving water for agricultural purposes, etc., which it is thought will meet the case, if it is considered practicable from an engineering point of view.

It has been submitted to the Malaria Bureau for an opinion as to the feasibility of its use by the Chinese market gardener; it is considered that it should be suitable in this respect.

The amount of work entailed by this survey has not permitted a detailed culicine larval survey of the area to be carried out, owing to the time that it would have taken. From time to time, however, culicine larvæ have been collected and adults bred out from larvæ and pupæ, and species identified microscopically.

Catches of culicine adults have been carried out in Chinese dwellings, pigsties, cow and buffalo byres and the species determined.

Routine catches of culicine adults, morning and evening, have only been carried out since August, 1935, although some collecting was done in May, 1935, and July, 1935.

During the period May, 1935, to June 30, 1936, inclusive, 12,006 adult culicines have been collected and identified.

The following species of "culicines" have been encountered in the area surveyed: *Culex bitaniorhynchus*, *C. sinensis*, *C. mimeticus*, *C. mimulus*, *C. tritaniorhynchus*, *C. vishnui*, *C. sitiens*, *C. fatigans*, *C. fuscocephalus*, *C. whitmorei*, *C. castrensis*, *C. pallidothorax*, *C. infantulus*, *Uranotania macfarlanei*, *Armigeres obturbans*, *Aedes albopictus*, *Mansonia uniformis*, *Luztia fuscans*.

The chief sources of the mosquito nuisance were found to be: *C. fatigans*, *Armigeres obturbans*, *Aedes albopictus*.

These species are all fierce biters and frequent human habitations. *Culex fatigans* is a carrier of filaria in the Colony.

The Chinese resident in the area, especially those living under primitive and insanitary conditions, must be regarded as possible native reservoirs of malaria infection, and a potential source of danger in this regard to the new cantonment.

Since malaria is not a notifiable disease it is impossible to obtain rates for the general population in any area, and it is not considered that dispensary statistics are reliable, as in nearly all the cases returned as malaria from these sources the diagnosis has been made on clinical grounds.

Apart from government employees, the vast majority of civilian cases of malaria occurring amongst Europeans and better-class Chinese, etc., are treated by private practitioners, whilst it is well known that many uneducated Chinese fight shy of Western methods of treatment.

The returns from the Government civil hospitals, however, are reliable, and do serve the purpose of giving a relative indication of the malaria incidence in certain areas, particularly when figures for corresponding periods, i.e. months, quarters, years, are compared, as presumably the potential patients of these hospitals remain, on an average, very much the same.

The number of malaria admissions to the Kowloon Hospital (a government civil hospital) probably represents but a small proportion of the total number of cases occurring on the mainland, but it is thought that they can be used as a guide to the malaria incidence.

In 1934, the admissions for malaria to the Kowloon Hospital included six cases from that portion of Prince Edward Road which lies between Argyle Street and Sai Kung Road, and five cases, including a fatal case of cerebral malaria, from Hau Wong Road (a road parallel to and east of Grampian Road). In 1935, the admissions to the same hospital for malaria included five cases (three malignant tertian and two benign tertian) from Grampian Road, Lung Hong Road, Ta Ku Ling Road, Po Kong Road, and Shek Ku Lung Road (all these roads run into Prince Edward Road south of old Kowloon City and vicinity), and one case of clinical malaria from Kai Yan Road (a road running into Kai Tak Road south-east of old Kowloon city and vicinity).

All these cases occurred in a modern well-planned built-up area but one which is in close proximity to localities already referred to.

It has been pointed out, earlier in this report, that the chief breeding places of *A. minimus* are to be found in those streams which flow towards and through fairly heavily populated Chinese areas.

Owing to various difficulties which exist in dealing with the Chinese population, resident in the area under survey, no spleen or parasite rates have as yet been determined.

The Chinese resent examination by Europeans and it is not considered advisable, for political reasons, to upset them in any way.

It was hoped that it would be possible to arrange for these investigations

to be carried out in conjunction with the Government Malariologist and the civil authorities. Owing to extreme pressure of work the authorities referred to have been unable as yet to co-operate, but will, however, endeavour to do so at a later date.

E.—INVESTIGATION OF SPECIAL FACTORS INFLUENCING MOSQUITO BREEDING.

(1) *Gradient of Hill Streams.*

It has been pointed out, earlier in this report, that the flat stretches of hill streams constitute the chief breeding places of certain species of anophelines, including *A. minimus*, a dangerous carrier of malaria in the colony.

The steep portions of the same streams do not, however, appear to be of any great importance in this respect.

They have been kept under observation month by month but, in spite of repeated and thorough searches, only occasional breeding has been noted—such breeding has been found to take place in isolated pools, whilst the species present was almost invariably *A. maculatus*—*A. minimus* being but rarely met with in these situations, and then only in extremely small numbers.

Where the gradient is steep the rate of flow is necessarily considerably increased which, in the rainy season, results in a fairly thorough flushing of the stream bed, and, in the dry season, is often sufficient to agitate the contents of pools occurring here and there.

A. minimus does not appear to be able to withstand swift currents like *A. maculatus*, and it is well known that water splashing into a pool definitely inhibits mosquito breeding.

It is also possible that the adult female instinctively avoids sites for oviposition so likely to be unfavourable for larval development.

The Government Malariologist states that elsewhere in the Colony but few *A. minimus* larvæ have been collected from those stretches of hill streams where the gradient is steep.

(2) *Cultivation.*

Investigations have been carried out in order to ascertain the influence of cultivation on mosquito breeding in the area under survey.

It has been found that cultivation, whether wet or dry, wherever irrigation ditches are in use, always produces a marked increase in anopheline breeding. Breeding takes place in these ditches and although the species present are mainly *A. maculatus* and *A. hyrcanus*, it was found that *A. minimus* also occurs, often in fairly large numbers.

Apart from the irrigation ditches, actual areas under wet cultivation (with the exception of paddy) have been considered in this Colony to be comparatively harmless from the malaria point of view (although they were known to be an important factor in the causation of mosquito nuisances),

because the predominant species of anophelines present were *A. hyrcanus*, the typical market garden breeder, and *A. maculatus*; the latter species occurring to a much lesser extent, whilst *A. jeyporiensis* was but occasionally found, and then in extremely small numbers.

It was, however, noted during the last quarter of 1935 that *A. jeyporiensis*, a species always present in paddy fields, was encountered in fairly large numbers in certain other types of wet cultivation.

Samples of plants grown in wet cultivation were collected, and sent, by favour of the Government Malariologist, to the Botanical and Forestry Department, Hong Kong, for identification.

The types of wet cultivation associated with *A. jeyporiensis* breeding have already been described in detail earlier in the report.

The area around Lion Head Farm is an interesting example of the influence of cultivation on mosquito breeding. This locality had been practically free from *A. minimus* and *A. jeyporiensis* until the month of October, 1935, when the former species was found breeding in large numbers and the latter to a lesser extent. This increase was not considered to be just seasonal because these species had been breeding continuously throughout the year in other parts of the area under survey.

Briefly, the factors leading to this change in the situation were as follows:—

Lion Head Farm was primarily a poultry farm, with but little cultivation in the vicinity; large tracts, however, were cultivated, irrigation ditches constructed and fresh huts erected. In a short space of time after these developments had taken place, the locality around assumed an entirely different aspect as regards the species of anophelines present.

A fair number of adult *A. minimus* and *A. jeyporiensis*, including males, were captured in the farm buildings, and fresh breeding places of both of these species were found to have developed in the vicinity, accompanied by a very marked increase in *A. minimus* breeding in the flat portions of the neighbouring hill streams.

(3) *Season.*

Extraordinary seasonal variations in the prevalence of the various species of anophelines breeding in the area under observation have been noted during the course of the survey.

It was hoped originally to repeat each month surveys of certain breeding places deemed of importance, but owing to various factors this was found to be impracticable, especially during the rainy season.

Variations in prevalence of the different species were found to be most marked in swampy areas. Unfortunately three out of the four main swamps in the area surveyed are situated in the danger zone beyond the rifle butts, and constant use of the ranges, from early morning till dusk, prevented monthly surveys of these localities being regularly carried out, although advantage was taken of Sundays, holidays, etc., when weather permitted, to proceed with larval collecting in the time available.

It is not considered, for reasons given above, that a reliable opinion can be expressed, based solely on the data obtained from the area under survey, as to the seasonal incidence of larval breeding of the various species of anophelines encountered.

A study of the information collected during the survey has, however, shown without doubt the absolute necessity of carrying out a larval survey over a period of at least a year in order to ensure that a fairly true picture is secured of the conditions likely to obtain as a general rule in an area intended for permanent occupation by troops.

A report, for example, on the incidence of that dangerous carrier, *A. jeyporiensis*, in the area surveyed, would be completely misleading were it to be based solely on data obtained during the months of May, June, July and August, for during this period this species was conspicuous by its absence, as is exemplified by the fact that only three *A. jeyporiensis* larvæ were collected from Swamp B7 in the time mentioned, although this locality is a notorious breeding place for this species at other times of the year.

A. jeyporiensis has been found to breed most abundantly in the area under survey from August to December.

A. minimus has been found breeding throughout the year in the area, except in the month of August. Larvæ of this species are scarce during the rainy season, when the streams are in spate; after the cessation of the rains, however, they breed fairly abundantly, chiefly in the flat boulder-strewn portion of hill streams, and in irrigation ditches close to or arising from them.

(4) Fish.

Although no investigations have been carried out on fish obtained from the area, due to the fact that they have been but rarely encountered, nevertheless information obtained, as a result of work done on fish collected elsewhere in the Colony, is included here, as it is considered that the employment of such fish as an antimalaria measure should be borne in mind, in the event of the development of the new cantonment site entailing at any time the construction of artificial reservoirs of a permanent nature (e.g. reservoirs fed by hill streams, constructed for conservation of water for flushing purposes, supply of swimming baths, etc.).

Fish obtained from streams in the vicinity of Sun Wai Camp were sent to the author of this report by Captain A. P. Trimble, R.A.M.C., for investigation as to their larva-eating properties.

Captain Trimble stated that he had not been able to obtain any mosquito larvæ from streams containing these fish. In 1930 and 1931 the author of this report was in camp in the same area and noted that where these fish were present mosquito larvæ could only be captured after very careful search of the grassy fringes of the streams, and then only in extremely small numbers.

The fish were placed under observation in the laboratory and mosquito larvæ were added to the bowls in which they were kept. It was found that

all the larvæ were devoured by the fish in a comparatively short space of time.

Specimens of species secured were sent by favour of the Government Malariologist to the Department of Agriculture and Commerce, Bureau of Science, Fish and Game Administration, Manila, P.I., and were identified as follows: *Puntius semifasciolatus* Günther, family Cyprinidae; *Rasbora takakii* Oshima, family Cyprinidae.

It is considered that if any artificial reservoirs are constructed on the new cantonment site, the stocking of them with these fish would constitute a useful antimalaria measure.

F.—INVESTIGATION OF THE RESTING AND FEEDING HABITS OF ADULT MOSQUITOES.

A series of adult catches has been carried out on the same dates in Chinese dwellings, pigsties, cow and buffalo byres, in order to compare the number and species of mosquitoes present.

It would appear from results obtained that *A. maculatus* and *A. hyrcanus* prefer animal shelters to human habitations, whilst *A. minimus* and *A. jeyporiensis* prefer human habitations to animal shelters.

This is interesting in view of the fact that the two latter species are the chief carriers of malaria in the Colony, whilst the two former are but of secondary importance in this respect.

The results of comparative adult "culicine" catches have also proved to be very interesting inasmuch as they show that *Culex fatigans*, the commonest species encountered in the survey, favours human habitations to a marked extent, whilst *Armigeres obturbans* and *Aedes albopictus*, the next commonest species met with, prefer animal shelters.

It is considered that the presence of domestic animals in the vicinity of human habitations plays a part in affording protection from malaria infection due to female anophelines seeking such animals as a source for their blood meals.

In 1934, at Shing Mun, where there were no domestic animals kept in the vicinity, with the exception of a few goats (belonging to the Indian police) and dogs, 89 per cent of the precipitin tests carried out on adult anophelines caught were positive for human blood, whilst at Wo Li Hop (a Chinese village about half a mile distant), where the inhabitants kept cattle, 83 per cent of precipitin tests performed were positive for cattle blood.

Precipitin tests were carried out on blood taken from 173 anophelines at Shing Mun and from 98 anophelines at Wo Li Hop.

Investigations carried out by the Government Malariologist, and confirmed by precipitin tests, seem to show that *A. maculatus* in the Colony prefers animal to human blood.

Some of the evidence collected by the Government Malariologist as to resting habits, etc., of adult anophelines is quoted here to illustrate points referred to above.

RECORD OF CATCHES AND DISSECTIONS FOR MALARIA INFECTION, OF ANOPHELINES OBTAINED FROM HUMAN HABITATIONS IN THE CHINESE VILLAGE OF LITTLE HONG KONG (WONG CHOK HANG) AND VICINITY DURING 1935.

(Catching took place on 304 mornings throughout the year.)

Species	Number of adults caught	Number of adults dissected	Number with infected glands only	Number with infected midgut only	Number with infected glands and midgut	Percentage infected
<i>A. maculatus</i> ..	15	16				
<i>A. hyrcanus</i> ..	33	30				
<i>A. minimus</i> ..	3,862	3,507	47	72	22	4.01
<i>A. jeyporiensis</i> ..	68	66			1	1.52
<i>A. tessellatus</i> ..	5	4		1		25.00
Totals ..	3,983	3,623	47	73	23	

RECORD OF CATCHES AND DISSECTIONS FOR MALARIA INFECTION, OF ANOPHELINES OBTAINED FROM PIGSTIES IN THE CHINESE VILLAGE OF LITTLE HONG KONG AND VICINITY DURING 1935.

(Catching took place every night except Saturdays, Sundays and holidays from August to December, 1935, inclusive.)

Species	Number of adults caught	Number of adults dissected	Results of dissection
<i>A. maculatus</i>	202	186	No adults were found infected
<i>A. hyrcanus</i>	243	231	
<i>A. minimus</i>	35	32	
<i>A. jeyporiensis</i> ..	8	8	
<i>A. tessellatus</i> ..	36	36	
Totals ..	524	493	

It is interesting to note that not one out of 493 adult female anophelines obtained from animal shelters, and dissected, was found to be infected with malaria, although these mosquitoes were captured during a most malarious time of the year.

While it seems highly probable that the presence at night of domestic animals in the vicinity of human habitations does afford man some degree of protection against being bitten by mosquitoes, it must be borne in mind that the difference in structure, etc., of human habitations and animal shelters may be an important factor in this respect.

Human habitations are as a rule bigger, loftier, cleaner, lighter and better ventilated than the animal shelters favoured as resting places, etc., by mosquitoes, since these structures are far more in accord with their biological requirements.

It was recorded earlier in the report that various observers have noted that *A. maculatus* and *A. hyrcanus* leave human habitations after feeding, and that the Government Malariologist had obtained confirmatory evidence of this at Shing Mun.

G.—FLIGHT AND DISPERSION OF ANOPHELINES.

The expression "range of flight" is used here to denote the distance which mosquitoes may fly, more or less directly, from their breeding places to sources of blood supply, such as human habitations and animal shelters.

The expression "range of dispersion" is used to denote the distance which mosquitoes may spread from their breeding places to various sources of blood supply—diffusion in this case takes place through mosquitoes travelling in the first instance from their breeding places to the nearest human habitations, etc., and proceeding thence to others much farther afield.

Whilst it is true that certain species of anophelines will travel at times several miles from their breeding places, in search of a blood meal, such a "range of flight" is not considered to be of usual occurrence; half a mile probably represents the ordinary or average limit of flight of most species.

The "limits of the range of dispersion" present a much more vexed problem, and some observers have shown that when intensive breeding is going on the "range of dispersion" considerably exceeds the ordinary "range of flight."

The factors influencing flight and dispersion include direction and strength of winds, intensity of breeding, number and density of human habitations and animal shelters, and their proximity or otherwise to breeding places, presence of natural barriers such as hills, afforested areas, etc.

According to Kligler, the direction of the wind is not as important as is generally supposed, for mosquitoes do not come when the wind is strong (at such times they are not active and seek shelter), but only when it is gentle or has subsided. He considers that the "range of flight" depends more on the intensity of breeding, and the number and density of dwellings and settlements and their proximity to the breeding places, whilst the "range of dispersion" from a breeding place varies directly with the intensity of breeding, and inversely with the density of settlements and population.

He has noted that if there are no settlements near breeding places (swamps), or if the breeding is very heavy, then mosquitoes will travel long distances to obtain a blood meal, using isolated habitations as stepping stones on the way.

According to Boyd it does not appear that breeding places giving rise to appreciable concentration of adults are situated at great distances from available blood supplies. He has found that, where suitable breeding areas exist in close proximity to blood supply little, if any, breeding will be found at a distance, indicating a disinclination ordinarily to take long flights.

The North-east Monsoon blows from November to May, and during this period the weather is as a rule dry, cool and invigorating. From May

till October, the season of the South-west Monsoon, the air is highly charged with moisture and the weather is hot.

A table of wind direction, compiled by the Royal Observatory, Hong Kong, is cited here, since a study of the data contained therein is of importance in forming an opinion as to the possible effects of wind direction on the flight and dispersion of anophelines over the new cantonment site.

PERCENTAGE OF WIND FROM THE EIGHT PRINCIPAL POINTS OF THE COMPASS FOR PERIOD 1884-1933.

Month	N	NE	E	SE	S	SW	W	NW	Calm	Number of gales
January	18	12	51	5	1	1	4	3	5	1
February	15	11	55	5	2	1	4	3	4	1
March	9	9	64	5	3	1	3	3	4	
April	4	6	63	6	7	3	3	3	5	
May	2	5	50	6	12	11	5	3	6	1
June	1	4	29	9	24	21	5	2	5	
July	1	4	28	12	19	16	9	3	8	19
August	2	4	25	9	12	16	14	6	12	19
September	8	10	39	9	5	4	9	5	11	23
October	16	16	48	8	2	1	2	2	5	9
November	24	19	42	5	1	1	2	1	5	3
December	23	15	44	5	1	1	3	2	6	1
Yearly average ..	10	9	45	7	7	6	5	3	6	Total 77

SUMMARY—	per cent	per cent	per cent	per cent	per cent
N.E.	9	SW. 6	N. 10	Calm 6	
E. 45		W. 5	S. 7		
SE. 7		NW. 3			
	61	14	17	6	Total 98

On looking at the table, it will be seen that the prevailing wind in the Colony is east, with a yearly average of 45 per cent, whilst wind from the eastern half of the compass has a yearly average of 61 per cent.

The bulk of anopheline breeding places are situated in the eastern half of the proposed cantonment site and to the east of its limits; investigation of the larval collections, made throughout the survey, reveals the fact that the vast majority of the larvæ met with have been obtained in the same areas.

It is also interesting to note that, with the exception of the Lion Head Farm area, all the most important breeding places, as regards intensity of production, are located to the east of the subsidiary watershed which, commencing south of $\Delta 1157$, runs roughly in a south-easterly direction towards the old walled city of Kowloon.

In considering the possibilities of mosquito invasion of the new cantonment site from the four principal points of the compass, various factors must be taken into account; whilst it must also be borne in mind that the concentration of a large number of troops and animals in the area will of itself be a powerful source of attraction to mosquitoes.

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In considering the risk of invasion of the cantonment site from the north, south, east and west, the terms "east" and "west" are used in a general sense, i.e. "east" includes south-east and north-east.

Risk of Invasion from the North.

This is considered negligible provided the hill streams are trained as required.

Ample protection is afforded by the massive chain of hills running from Beacon Hill on the west to Grasscutter's Pass and beyond on the east; it is well known that mosquitoes show little inclination to vertical soaring.

The stretches of hill streams flowing through this area in a southerly direction from the main watershed are characteristically of steep gradient, whilst some breeding places of *A. minimus* and *A. jeyporiensis* have been located in portions of these streams the number of larvæ collected of these species has been but small.

In addition there are no habitations in this area with the exception of a few dwellings in the vicinity of Shatin Pass.

Risk of Invasion from the South.

Potential sources of invasion exist in the "D" valley (a locality not considered of major importance though a likely source of a "mosquito nuisance") and in the region to the east of Grampian Road. "D" valley is a dangerous area, but further reclamation by the Colonial Government will probably entail reclamation and drainage of this valley and training of rest of stream "D."

The remainder of this area has either been, or is being built on, whilst a certain amount of antimalaria work, etc., has been carried out affording protection to the Kowloon Hospital and residential districts.

Risk of Invasion from the West.

Extensive antimalaria work has been carried out on this flank by the Colonial Government to protect the Kowloon Tong Estate—this estate in itself is likely to bear the brunt of any invasion from a westerly direction.

The topographical features and the afforestation carried out on the western flank, referred to earlier in this report, afford of themselves a considerable degree of protection, whilst there are but few native habitations and cultivated tracts in this area, with the exception of the region west of the Kowloon Tong Estate.

The only breeding places deemed of special importance (with the possible exception of the area of wet cultivation between streams G and G1) are located in stream G2D—former dangerous breeding places having been dealt with by the Colonial Government.

Risk of Invasion from the East.

This is deemed considerable unless intensive antimalaria measures are carried out.

This area contains abundant and intensive breeding places of *A. minimus*

and *A. jeyporiensis*, together with a considerable native population in fairly close proximity to them. The fact that 61 per cent of the wind direction (yearly average for fifty years) is from the eastern half of the compass has already been pointed out.

Wind Velocity at Sunrise and Sunset.

According to Boyd "the wind velocity at about the time of sunset and sunrise is an important factor in determining the amount of anopheline activity on any particular occasion. As a rule the velocity at these hours is at the minimum, and consequently favours their activity. When strong breezes prevail at these hours, little activity may be expected."

In order to ascertain the effect of the wind velocity at these hours on the flight and dispersion of anophelines over the area surveyed, a table has been compiled showing the mean monthly wind velocity at sunrise and sunset for the period 1884 to 1933.

This table has been constructed from data supplied by the Director of the Royal Observatory, Hong Kong, who kindly furnished tables giving: (1) Mean monthly times of sunrise and sunset in the Colony; (2) mean hourly velocity of the wind for each month for period 1884 to 1933.

MEAN READINGS OF MONTHLY WIND VELOCITIES IN HONG KONG AT SUNRISE AND SUNSET OVER A PERIOD OF FIFTY YEARS (1884 TO 1933).

MONTH			SUNRISE			SUNSET		
			Hour	Statute M.P.H.	Reading on Beaufort's scale	Hour	Statute M.P.H.	Reading on Beaufort's scale
			A.M.			P.M.		
January	..	..	7.05	8.44	3	6.00	9.09	3
February	..	..	6.56	9.95	3	6.19	9.61	3
March	..	..	6.32	10.87	3	6.33	10.19	3
April	..	..	6.04	9.45	3	6.43	10.00	3
May	..	..	5.44	7.88	2	6.56	8.75	3
June	..	..	5.39	7.47	2	7.08	7.96	2
July	..	..	5.48	6.58	2	7.09	7.84	2
August	..	..	6.00	5.53	2	6.54	7.05	2
September	..	..	6.10	6.88	2	6.27	8.34	3
October	..	..	6.20	8.94	3	5.59	9.44	3
November	..	..	6.36	8.29	3	5.41	8.99	3
December	..	..	6.55	7.72	2	5.42	8.88	3

On referring to the table it will be seen that the mean wind velocity at sunrise and sunset is either No. 2 or No. 3 on Beaufort's scale.

The strength of wind denoted by these numbers may be expressed as follows:—

Beaufort No. 2: Wind felt on face, leaves rustle; ordinary vane moved by wind.

Beaufort No. 3: Leaves and twigs in constant motion: wind extends light flag.

It is evident therefore that the wind velocity at sunrise and sunset is, generally speaking, favourable to anopheline activity (including flight and dispersion) throughout the year in this Colony.

H.—LIAISON WITH GOVERNMENT MALARIOLOGIST.

Liaison with the Government Malariologist, Dr. R. B. Jackson, and with Dr. J. B. Mackie, who has acted for him since his departure on leave, has been maintained throughout the course of the survey.

The Government Malariologist was kept informed of all data obtained during the course of the survey, and has, in consequence, made recommendations to the Colonial Government concerning the training of certain streams in those portions of the area which the survey had shown to be a potential source of danger to the civilian population in residential districts.

Some of the work recommended by him has already been carried out, and further training of certain streams is under consideration by the Colonial Government.

The training referred to will reduce the amount eventually required to be carried out if the development of the new cantonment site at Kau Lung Tsai is proceeded with.

Visits have been paid with Dr. Jackson, Dr. Mackie, Mr. M. R. Deb, and other members of the staff of the Malaria Bureau to various parts of the Colony with the object of investigating breeding conditions, methods of drainage employed, etc. The Malaria Bureau have been responsible for carrying out a good deal of rough semi-permanent drainage of hill streams which withstands heavy rains quite well and is exceedingly cheap, since no concreting is carried out. This method, although it gives excellent results, requires in addition oiling and skilled supervision. The cost of upkeep and oiling is very small. Some of the most notorious *A. minimus* breeding streams in the Colony, where permanent training would have been exceedingly expensive, have been dealt with in this manner under the supervision of Mr. M. R. Deb, the Assistant to the Malariologist, and have in consequence been rendered practically innocuous. This system of drainage is not, however, recommended for military use unless skilled supervision is available.

I.—RECOMMENDATIONS.

It is considered that the proposed new cantonment site at Kau Lung Tsai can be rendered reasonably free from malaria provided that sufficient antimalaria measures are carried out. This opinion is based on both a study of information received from the survey and consideration of investigations carried out and data collected by the Government Malariologist elsewhere in the Colony.

The recommendations proposed may seem somewhat extensive, but they are deemed necessary in view of the fact that the concentration of a large

number of troops in the cantonment will of itself prove a powerful source of attraction to mosquitoes, and since it is well known that communal sleeping arrangements, such as obtain in barrack rooms, favour the diffusion of malaria in the event of defective protection.

The sphere of antimalaria control, except where otherwise stated, should embrace the area bounded on the map by a dotted line, with an extension on the eastern flank to Shatin Pass Road.

Permanent training and concreting, etc., of streams are recommended for : (1) All streams in the new cantonment site. (2) " B " and " F " series of streams, up to a height of approximately 750 feet, in the area north of the cantonment site. (3) Portions of stream D1 in the area south of the cantonment site. Stream " D " will probably be dealt with by the Colonial Government in course of further reclamation—if not, it will require training, etc. (4) Stream G2D, and possibly portions of G, G1 and G2, in the area " west " of cantonment site. Training of remaining " G " streams to be deferred for the time being as carrying out of other permanent works recommended may suffice. (5) All " B " series of streams in area " east " of cantonment site. Training of " A " series of streams at a later date may possibly be required, but it is considered improbable that such a necessity will arise.

The amount of training required for each stream should be determined, after discussion on the site, by consultation between the Officer i/c Malaria Survey and the Royal Engineers.

All swampy areas and abandoned paddy fields should be permanently trained on the lines recommended, and tracts of wet cultivation in their immediate vicinity resumed, with possible exception of those situated west of Kowloon-Canton Railway.

All seepages, up to a height of approximately 750 feet, to be dealt with in a permanent manner in the area extending from Kowloon-Canton Railway on the west to Shatin Pass Road on the east.

Open-air laundries should not be discouraged, since the soapy effluent from them has a definite deterrent action on anopheline breeding. Steps should be taken to prevent mosquito breeding when laundries are not in use.

Such cultivation as is not resumed to be restricted as far as possible to " dry " cultivation ; wet cultivation, if permitted, should be confined to growing of watercress.

Irrigation ditches and channels must be eliminated as far as possible ; where elimination is not feasible they should preferably be concreted, but earthen ditches can be permitted provided certain conditions are observed.

The number of wells (except those used for supply of drinking water) and sumps should be restricted as far as possible. Wells should be fitted with suitable lids and kept covered when not in use.

It is considered that wells (except those used for supply of drinking

water) and sumps could be abolished in those cultivated areas which are in vicinity of streams if the "gate" system were introduced and irrigation channels and ditches, constructed on the lines recommended, were permitted where necessary.

"Culicine" breeding in artificial receptacles, such as tubs, tanks, cisterns, kongs, septic tanks, discarded tins, burial urns, etc., is a prolific source of "mosquito nuisance" but difficult of control outside cantonment site.

Rain water collects in burial urns when these are damaged or their lids are loose fitting, broken or missing, and mosquito breeding results in consequence. All burial urns should be kept sealed and any damaged in such a way as to trap water, replaced.

The "mosquito nuisance" complained of by the whole of Kowloon east of the railway and by the Royal Air Force at Kai Tak, is largely due to "culicine" invasions from cultivated areas. The Colonial Government have evolved a method for dealing with this and are considering its application to certain areas.

It is recommended that the Colonial Government be asked to extend their sphere of operations (including permanent supervision and control), to embrace areas outside W.D. boundaries, stretching for half a mile from such boundaries, with an extension on the Eastern flank to Shatin Pass Road.

Steps must be taken to eliminate and prevent all "culicine" breeding in artificial receptacles, especially cisterns and septic tanks, in the new cantonment. Cisterns, etc., should be mosquito proofed on the lines laid down.

Installation of roof gutters must be avoided where possible; large roof gutters when installed to have permanent slope of 1 inch in 24 feet. Periodical inspection of roof gutters should be carried out in the rainy season and debris removed.

Stand pipes should have concrete bases and concrete drains connected to the main drainage system.

Ponds, moats, etc., should be filled or drained. If this is impracticable they should be kept clear of weeds and stocked with larvicidal fish or oiled. The Colonial Government should be asked to deal with ponds, etc., outside cantonment boundaries.

Artificial reservoirs, if constructed, should be stocked with larvicidal fish and the margins kept free from vegetation.

No mosquito breeding due to building operations, should be allowed to occur on the new cantonment site and contractors should be made responsible for prevention of mosquito breeding.

Temporary collections of water, resulting from heavy rain, and which do not drain away within a few days, should be oiled.

Permanent measures should be undertaken where possible, since such work, properly maintained and supervised, means final abolition of breeding

places; the initial cost of this is high but the cost of upkeep is fairly small and the supervision required is not difficult and can be undertaken by a small and more or less unskilled staff.

Temporary measures, on the other hand, entail constantly recurring expenditure, whilst a large staff and constant and skilled supervision is necessary to secure efficient control.

Temporary measures are only recommended when the cause itself is temporary, or the cost of permanent work is deemed too high in view of the objects aimed at, or permanent work is difficult to carry out, while fairly good results can be obtained by such measures as efficient oiling.

Planting of certain trees and plants causes surface water to dry up and reduces the level of subsoil water—belts of high trees, as distinct from low jungle or scrub, act as important screens against mosquito diffusion.

Forestry plantations and reserves, maintained by the Colonial Government, afford protection on the western flank, but areas to the north and east of the cantonment site are but sparsely wooded.

Suitable trees should be planted where possible between breeding places and human habitations—such natural defences as exist should not be disturbed, except where absolutely necessary for development of the new cantonment. It is suggested that the Colonial Government be asked to co-operate in planting trees outside W.D. boundaries—if the Colonial Government could be persuaded to maintain forestry plantations and reserves on the eastern flank, similar to those on the western flank, it would be of great benefit to the new cantonment.

The presence of domestic animals at night near human habitations affords some degree of protection; horse and mule lines should be located, if possible on the eastern side of the cantonment—in any case such lines should be sited at least 50 to 100 yards away from human habitations to afford effective protection.

Jungle, long grass, etc., afford shelter for mosquitoes during the day time and should be cleared away in the vicinity of buildings intended for human habitation. Indiscriminate clearing is to be avoided and the banks of streams not recommended for training should not be cleared, since such clearing would encourage *A. minimus* and *A. maculatus* breeding.

It is considered that the hydraulic system of levelling is far preferable, from the antimalaria point of view, to cutting, filling, levelling, etc., by hand.

Hydraulic levelling will appreciably reduce the amount of permanent antimalaria work required on the new cantonment site, while such permanent work as is necessary will be easier to carry out and less expensive in detail; the cost of upkeep and amount of supervision entailed will be proportionately smaller.

Reclamation by hand filling, etc., as normally carried out in similar areas in the Colony, involves temporary formation of large “sumps” containing fresh water, and may result in temporary interference with the natural drainage, leading to formation of dangerous breeding places.

100 *Antimalaria Report upon Proposed Site at Kau Lung Tsai*

It is not considered that the use of salt water, involved in the hydraulic system, will cause any fresh mosquito breeding to take place; on the contrary its use should inhibit some of the existing breeding.

Coolie lines should be sited at a distance of at least half a mile from the boundaries of the new cantonment site, in order to avoid the presence in the area surveyed of a powerful source of attraction for adult mosquitoes and a potential native reservoir of infection which would lead to marked increase in the number of infected mosquitoes, marked increase in mosquito breeding, and complaints from Kowloon Tong of increased mosquito prevalence, followed by an inevitable increase in malaria incidence in that locality.

A valuable natural barrier against mosquito invasion exists in the important subsidiary ridge already referred to. The minimum amount of interference with this ridge, compatible with suitable development of the new cantonment, is strongly recommended.

Further restriction in size of the cantonment site will entail reduction in the size of area requiring permanent antimalaria control, and in the cost of this, but such reduction will not be proportionate to the extent of the permanent work required and its total cost.

In the event of the cantonment site being further restricted permanent antimalaria work need possibly only extend on the eastern flank as far as the boundary indicated on the map by a dotted line, provided that the important subsidiary ridge is left intact—if, however, this ridge is not left unchanged antimalaria work should extend as far as Shatin Pass Road.

Restriction of the site will have little effect on the amount of permanent antimalaria work required to the north, south and west of the cantonment.

Thanks are due to Dr. R. B. Jackson, M.D., B.Ch., D.P.H., Government Malariologist, for his invaluable assistance and advice. It would have been extremely difficult to carry out all the work entailed by this survey without the information, maps and laboratory facilities, etc., which he so kindly placed at my disposal.

Thanks are also due to Dr. J. B. Mackie, M.B., Ch.B., D.P.H., D.T.M., who has acted for Dr. Jackson since his departure on leave home, and to the Staff of the Malaria Bureau who have readily and cordially given me every assistance required.

Thanks are also due to C. W. Jefferies, Esq., F.R.A.S., Director of the Royal Observatory, Hong Kong, who kindly furnished me with the meteorological data required for this report.

Pte. F. E. Hall, R.A.M.C., has proved a very hard and capable worker in the field, whilst Pte. P. H. J. Westwood, R.A.M.C., has shown special aptitude for laboratory work entailed in the survey and has been responsible for the preparation of spot maps and graphs, and the compilation of some of the tables in this report, other than those furnished by the Government Malariologist.

“YET ANOTHER”—THE T.O.T. DISINFECTOR.

BY LIEUTENANT-COLONEL T. O. THOMPSON, M.A., D.M., D.P.H.Oxon.

Royal Army Medical Corps.

EARLY in 1933 instructions were received from the Deputy Director of Hygiene, H.Q. Simla, to devise a new form of disinfector or disinfectant in place of the type at present in use for field service conditions, and a certain sum of money was allotted for the purpose of conducting the necessary experiments.

Throughout this description the words disinfector and disinfection are used although in actual practice disinfection is really the normal purpose of the apparatus.

The particulars of the stipulations issued for this experiment and for the resulting apparatus can be summarized as follows :—

A portable disinfector of such a size that three or four can be packed into an Army Transport cart. It is not required for mule pack transport, but is to be capable of transport as a camel-pack load.

The output per hour to be approximately that of the Lelean Sack, three or four machines being required per brigade.

The normal method of conveyance would be by Army Transport cart or by lorry.

The method of heating was to include heating by means of the Jubbulpore burner which was at that time being initiated as the oil burner for cooking purposes for troops in the field.

The method of disinfection and type of apparatus was left entirely to my choice, but the apparatus was to be as inexpensive as possible.

From the foregoing it became apparent that yet another downward displacement disinfector would meet requirements. No form of chemical disinfection appeared to be suitable.

But it was obvious that no mere re-duplication of any of the previous types of downward displacement field disinfectors would produce any definite improvement. Further it appeared to be essential that any new type should be made as completely foolproof as possible and with a minimum of movable or breakable parts.

The stipulation that the form of heating was to include the Jubbulpore burner, now known as the G.C.F. oil cooker, indicated the type of boiler which could be employed for this purpose, but it was also considered that heating by a wood or coal fire and by Primus stoves should be made possible.

It will be seen that all these forms of heating can be readily used on the flat-bottomed boiler of the present apparatus.

From experience with many of the previous types of disinfectors employed for field service, it was determined to eliminate, if possible, any movable pipes and steam connections, pressure gauges and any such external excrescences.

This is a point which is well worth emphasizing, as whenever this machine has been sent for trial and report some adverse criticism has almost invariably been made about the absence of pressure gauges or safety valves, or other such paraphernalia, which in this case had been deliberately omitted to ensure simplicity of design and robustness for practical use.

A further point which appeared to be essential for maximum output was that the process of handling the material to be disinfected should be continuous and not spasmodic with intervals of inaction.

After considerable thought the method described below was devised and appeared to meet the requirements extremely well, and has been embodied in the present form of "Yet another," or the so-called T.O.T. disinfector.

This particular method is that the steaming chamber and the boiler are all in one, with a steam escape pipe situated closely over the surface of the water in the boiler.

The steam escape pipe consists of a metal tube fixed into and through the ends of the chamber with one or both ends open to the exterior. To the centre of this pipe a vertical piece of piping is fixed to form an inverted T-piece, of which the top end or butt of the "T" is open, the steam exhaust hole giving access from the interior of the chamber through the horizontal pipe to the exterior (*see* figs. 2 and 3).

Firmly fixed round this vertical \perp pipe is a flat platform with a thick fibre washer (*see* fig. 2).

The steam escape pipe is built into the chamber and actually forms part of the support of the container during the process of disinfection (*see* fig. 2).

There is no steam inlet pipe, because the container, holding the articles to be disinfected, is placed inside the steam chamber.

On being placed in position the bottom of the container forms a washered contact joint with the flat platform round the steam exhaust hole. The weight of the container closes the escape of the steam and forces the steam to pass upwards round the outside of the container, over its top and down through the contents in order to reach the exhaust pipe which projects through the base of the container.

Immediately the container is placed *properly* in position and the lid has been closed the full circuit of steam is carried through the articles to be disinfected. There are, therefore, no adjustable pipes or irritating breakable steam connections, and all the parts can easily be made strong enough to meet rough usage.

The whole essence of the design is, therefore, the fact that the act of placing the container in position alters the circuit of steam by shutting off

the steam escape hole from direct access from the boiler and, when the lid is clamped down, there is no way for the steam to escape except down through the container.

There are two containers, one rather smaller than the other, so that they can be used alternately in the steaming chamber, ensuring that the process can be practically continuous, one container being unloaded and repacked with fresh articles while the contents of the other are being disinfected in the steaming chamber. One container is made smaller than the other so that the smaller can be placed inside the larger when packed for transport. In this manner, the whole outfit, except the G.C.F. oil cooker, can be carried as one compact load.

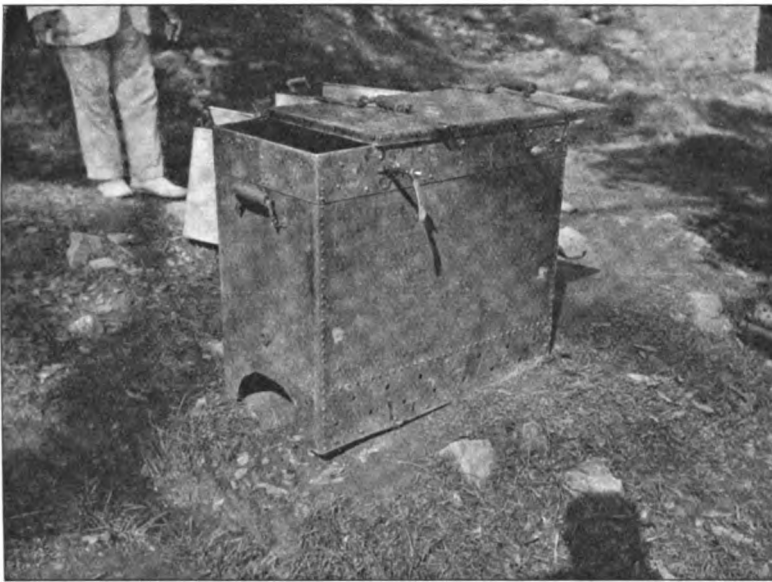


FIG. 1.— Showing the disinfecter with lid open, lid clamps, handles, the arched exit of the fire box with the steam escape pipe protruding just above it. The two containers are just visible behind the disinfecter.

The bottom of each container is sloped down from the ends to the centre where there is a flattened area around the central hole which fits over the \perp piece of the steam escape pipe. This flattened area engages on to the fibre washer on the escape pipe seating and forms the seal which closes the exit for the steam and compels it to take the circuit through the container. The flattened area is protected by two stout metal side pieces (*see fig. 5*).

To prevent the contents of the container from becoming wet from condensed steam in this lower conical portion of the container a stout expanded metal grating, supported on arched cross pieces, is inserted across the whole width of the container. This also prevents any undue packing of the contents over the steam escape hole which might cause a block in

the escape of steam. It also ensures that the lowest article in the container is well above the steam escape hole and is, therefore, fully bathed in dry descending steam.

The lid is lagged with cheap, easily replaceable asbestos rope, hammered into a groove. This rope lagging engages with the top edges of the sides of the steam chamber, the lid being held down in position by four easily turned screw clamps which allow rapid opening and closing. The inner face of the lid is lined with cheap felt to absorb condensed steam which might otherwise drip on to the topmost article in the container.

The whole method is illustrated diagrammatically below in fig. 2.

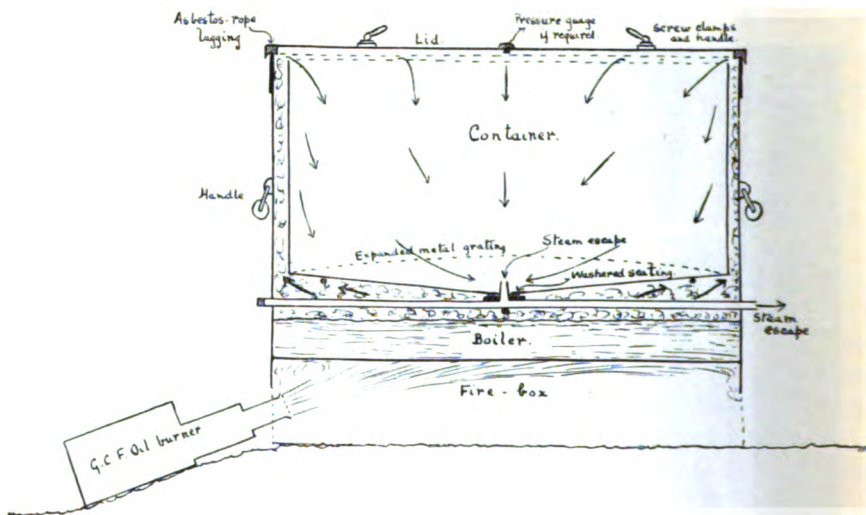


FIG. 2.—Diagrammatic scheme of steaming chamber and container of the T.O.T. Disinfector.
(Note.—This design of disinfector has been patented for civil production.)

A number of models of this disinfector, half and full scale, have been made and tried out under ordinary working conditions. These include trials during active operations by Sanitary Sections, in ordinary camps and in the ordinary daily disinfection at a large hospital for a prolonged period during which a semi-fixed, standard pattern disinfector was out of action.

Whenever the instructions for the use of the machine have been properly followed, the apparatus has been satisfactory and has proved to be capable of hard continuous work to its full capacity and able to withstand rough usage.

Adverse criticism has, it is true, also been received ; but examination in each case has shown that the personnel concerned had quite misconceived the scope of the apparatus or devoted their criticism to the G.C.F. burner which was in no way a real part of the design of this apparatus and, happened to be an early experimental model of the burner. For example, one group, to whom the machine was sent for trial and report, stated

that it was too heavy for mule transport, that it was not considered desirable that it should be conveyed in a lorry, that the burner supplied would not heat it, and finally that the lid leaked. On investigation, it was found that the "Instructions for use" had been lost without being read, the burner had been damaged before being used, and when brought into use was placed flat on the ground in a position in which it could not possibly heat the boiler, and finally part of the packing from the lid had been removed. Incidentally it may also be recalled that the apparatus was never designed as a mule load, but was designed for carriage in an Army transport cart or lorry, or as a camel load.

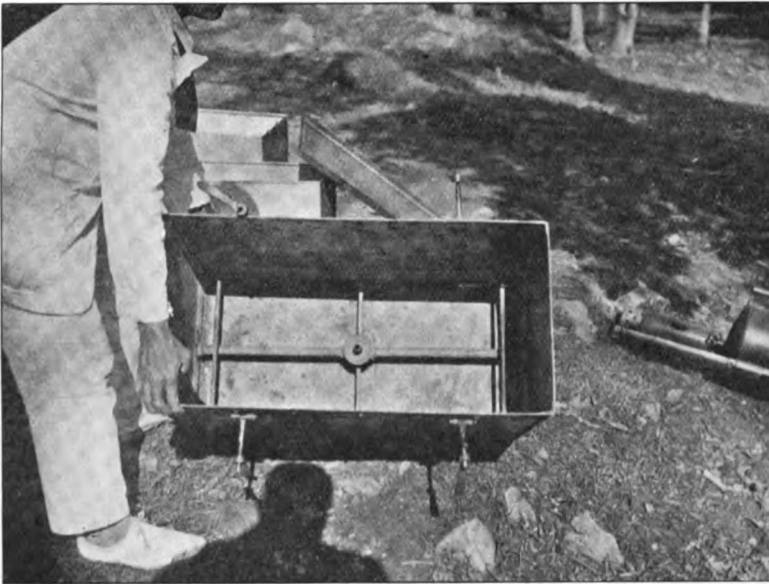


FIG. 3.—Disinfector tilted to show steam box with boiler, steam escape pipe with central T-piece opening and washer, central transverse bar and end support bars for the containers.

In spite of the above and similar criticism it is claimed that this is a most useful and suitable apparatus for disinfection under field service conditions, or in any place where large fixed apparatus is not available or required.

The design makes it practically fool proof and free from movable parts which may be damaged. It can be made by any ordinarily intelligent workman in a blacksmith's shop, and, even if damaged, can readily be repaired without delay. There are no canvas or rubber armoured pipes which are difficult to obtain or replace under field service conditions. The washer at the steam escape hole can be very readily replaced, and any ordinary cotton or fibre rope can be used as lagging round the lid joint, if the lagging which is provided becomes unserviceable.

For heating, any oil burner which throws a long flat flame gives the

best results. This, as will be seen in the instructions, is directed on to the flat bottom of the boiler by the simple expedient of digging a shallow trough with an upward slope on which the burner can rest.

A wood or charcoal fire is almost equally efficacious, especially if used in the form of the earth *Chula* dear to the Indian heart. It is not necessary, therefore, to have to rely on any other artificial form of heating.

With the size of apparatus given in the description and line plans, two men are required. Two men can manage *one pair* of disinfectors; but they have to be thoroughly trained and are occupied continuously and can only work in short shifts.

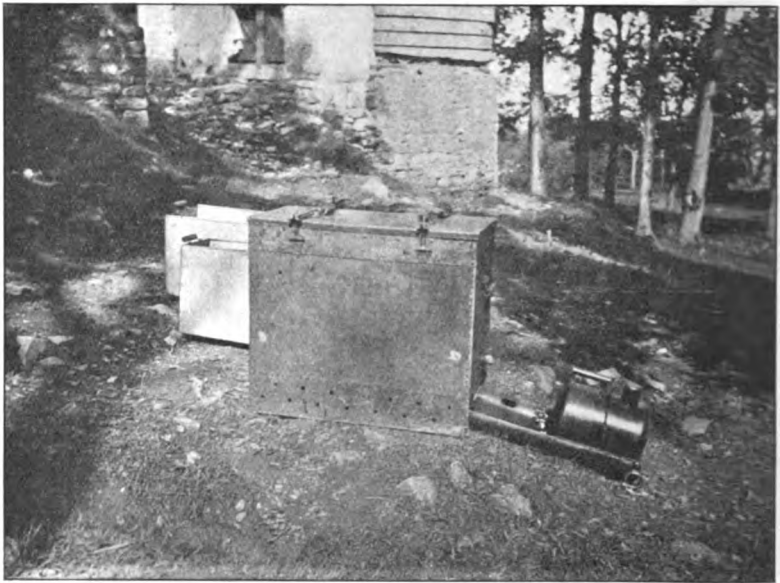


FIG. 4.—Disinfector in action with G.C.F. burner in position. Note.—The burner is placed on a convenient sloping bank instead of in a sloped trench.

The average output per machine should be 30 to 35 blankets per hour, but 34 to 40 blankets per hour have been obtained by a skilled crew; see the report on four hours trial on page 110, Appendix II. Objections have been raised that in this size of apparatus the containers cannot take 10 or 11 blanket per load as stated. It is true that blankets which are quite new may be too bulky to allow of this number, but it was found that with the average blankets actually in use by Indian personnel the number stated could be packed at each steaming, provided the instructions as to folding the blankets were followed.

The cost of fuel in the burner is approximately three-quarters of a gallon of paraffin oil per hour.

The weight of a battery of four machines is about 660 pounds, compared

with two tons for the weight of the standard semi-portable commercial type which gives approximately the same output.

Although the machine, here illustrated and described, is actually given as an oblong box of certain dimensions, it should be clearly realized that this does not indicate that no other size or shape can be used. In fact, this type of apparatus could be made any size or shape, within reasonable limits, to meet requirements for any special purpose. The size and shape used in this case was to comply with the stipulations that the apparatus should be capable of transport in an Army transport cart, three or four to a cart, or in a lorry, but should be portable as a camel pack, and finally

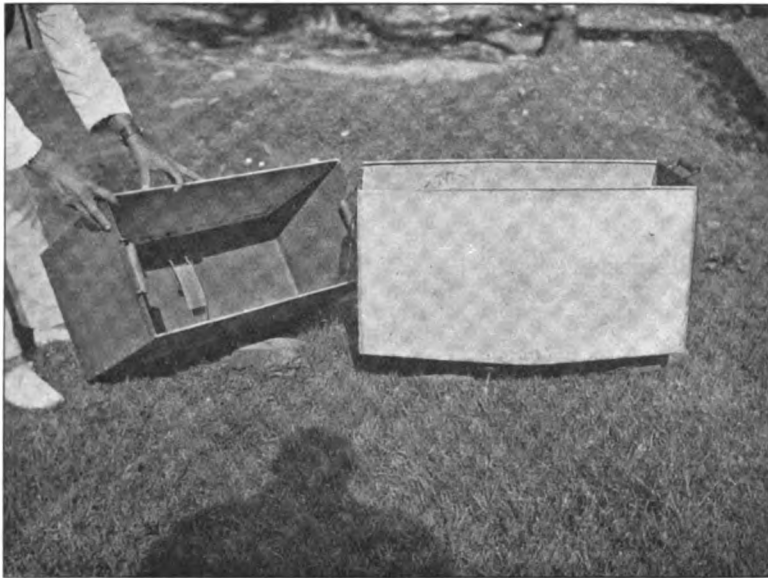


FIG. 5.—Containers, showing shape and size and the central hole. *Note.*—The gauze or expanded metal cover now extends over the whole of the bottom of the container and the handles are made removable so that only one pair is required.

that the output should be such that a battery of three or four in an Army transport cart would constitute a unit for disinfection for a Brigade.

In actual fact the writer has a model made to half scale of the size described—that is, one quarter the capacity—which works perfectly efficiently for small garments and could readily be used as a steam cooker for vegetables and has been so used.

At the beginning of this description it was pointed out that the word disinfection would be used, whereas the normal purpose of the apparatus would be disinfestation. The apparatus is, however, capable of being used as a true disinfector to the extent of a five pound pressure of steam by the addition of a pressure gauge, safety valve and stop cock. In the lid a hole for fitting a pressure gauge or safety valve can be arranged, and the end

of the steam escape pipe can be provided with a thread for fitting a steam stop cock. For ordinary field work the hole in the lid is omitted or plugged with a washered bolt.

Fitted with these additions, it was found that killing of organisms, other than resistant spore bearers, was attained easily even at hill stations at a height of 7,000 feet (*see* the report of trials below).

These additions have, however, been deliberately left out in the normal model to eliminate movable or breakable parts.

In view of its simplicity, the absence of movable or breakable parts, its effectiveness and its transportability, it is considered that this apparatus



FIG. 6. —Disinfection in progress. Container “B” has been loaded and is ready to replace container “A” as soon as the steaming of the latter has been completed.

is definitely superior to any previous design of disinfector with which the writer has been associated.

It is on these grounds that the writer has ventured to submit this description for publication in our Journal. Details of construction and instructions for the use of this disinfector are appended below, but it would be as well to point out that permission has been given for the design to be patented for civil purposes and this has been done.

The following extract from a letter received from the D.A.D.H. of the recent Khaisora operations in Waziristan may, with advantage, be quoted here.

One of your T.O.T. disinfectors has arrived. We tested it yesterday on some lousy clothing and blankets and found that with the Jubbulpore G.C.F. burner it worked most satisfactorily. It only

took fifteen minutes to complete each cycle of loading-steaming-unloading-drying; so that we can put through 40 blankets each hour. I think it is a most ingenious and valuable apparatus and ought to be eminently suitable for use in mobile warfare in any part of the world.

A later comment is as follows :—

I have no objection whatever to your quoting extracts from my letter about your T.O.T. disinfector. Further experience of it here confirms my opinion of its great value. I think you have got hold of a really useful portable disinfector in it, which should form part of the equipment of every Field Ambulance or, if preferred, every sub-section of Sanitary Sections. It has been most useful for the short time we have had it on these operations.

In conclusion, thanks are due to Mr. J. O. West and Mr. Habibullah Khan of the Military Engineering Service for the very considerable trouble they took in the experimental and manufacturing stages, and also to Major-General W. H. Hamilton, C.I.E., C.B.E., D.S.O., I.M.S., K.H.P., for his interest in the use of this disinfector on recent operations and permission to send this account for publication.

APPENDIX I.

REPORT ON ORIGINAL TRIALS OF THE T.O.T. DISINFECTOR.

(1) *Effectiveness of Disinfection and General Points of Apparatus.*

August 1, 1933.

Water four gallons, put in cold.

Heating with dry firewood and shavings, steam in ten minutes.

Heating with Jubbulpore burner, steam in ten minutes.

Heating with ration wood in trench fire, steam in fifteen minutes.

August 2, 1933.

Container A packed with eleven blankets, to fill with steam twelve minutes.

Container B packed with ten blankets, to fill with steam ten minutes.

Tests of Effective Temperatures.

Containers packed with blankets.

Temoine tubes of 80° and 98° C. placed in pairs at three levels in the load. Steaming carried out five minutes after full spout of steam appeared.

Result.—80° C. tubes melted; 98° C. tubes melted.

This result was surprising and gratifying because in Murree, at 7,000 feet, it was found that water boils at 93° C. This was the actual temperature taken in the boiler of this disinfector. The temperature of the steam issuing from the escape pipe was 91° C.

Therefore a positive pressure of steam with a higher temperature must be attained in the steam box. This increased pressure is shown actually by the jet of steam which escapes when the lid clamps are released, and which is sometimes sufficient to extinguish the burner.

Vermin.

Bugs and lice were placed amongst the blankets at three levels in the load. All vermin were killed every time with five minutes full steaming.

Organisms.

Cultures of staphylococcus, *B. coli*, spore bearer (*subtilis*), on blotting paper strips, were placed at three levels in the loads.

Staphylococcus and coli were killed with ten and five minutes full steaming.

Spore-bearing organisms were *not* killed with five and ten minutes full steaming.

This latter result is not surprising considering the low temperatures of steam available.

If pressure steam is employed, it may be possible to destroy spore-bearing organisms. Additions of stop cocks and safety valve to the disinfector will probably enable a pressure of five pounds steam to be produced. This will be tried out later.

APPENDIX II.

6.8.1933. Four hours trial run 14.40-18.28.

Burner placed into fire box entrance and protected from wind after initial trouble. Burner filled full to test results of one filling.

Burner started	Boils	Con- tainer put in	Steam whisps	Steam spouts	Steamed to	Blankets	
14.40-14.45	15.10	15.15	15.17	15.25	15.30	11	6½ gallons water put in. Rather too full. Some trouble with burner.
		15.32	15.38	15.41	15.46	10	
		15.48	15.55	15.59	16.04	11	
		16.07	16.14	16.17	16.22	10	(Note.—The G.C.F. burner has been very much improved since that date.)
		16.25	16.27	16.33	16.38	11	
		16.42	16.47	16.51	16.56	10	
Fresh water		17.01	17.05	17.09	17.14	11	
		17.18		17.25	17.30	10	
		17.33		17.43	17.48	11	
Fresh water ½ gal.		17.51		17.56	18.01	10	
Fresh water ½ gal.		18.04		18.07	18.12	11	
		18.16		18.23	18.28	10	
Fresh water ½ gal.		18.32		18.36	18.41	11	
		18.44		Burner expired	—		
Total						137	

137 blankets in 4 hours whole run = 34 blankets per hour.

or 3½ hours actual steaming = 42 blankets per hour.

Note.—This represents a 4-hour spell of hard work. Personnel would probably do two spells per day, i.e. one disinfector with two men would do one company per day.

APPENDIX III.

INSTRUCTIONS FOR THE USE OF THE T.O.T. DISINFECTOR.

(Thompson's ordinary transport disinfector.)

Description.

An oblong box of mild sheet steel forming a steaming chamber which is closed by a lid held down by simple screw clamps.

The bottom of the steaming chamber forms a flat-bottomed boiler with a capacity of about five gallons of water. The lower part of the box forms a fire box for heating the boiler, heating being carried out either by a Jubbulpore G.C.F. burner or by a fire of wood or coal, for which a simple earth chula or trench fireplace is required.

Material to be disinfected is put into a simple removable container which is placed into the steaming box. Steam is generated in the boiler portion of the box and fills the whole chamber.

The container is so arranged that its lower surface engages flush on to a washered seating round the escape pipe.

When the container is placed in position on the washer round the steam escape pipe, which it effectively seals, the steam cannot escape except by filling the chamber, by filling the container by downward displacement, and finally by reaching the escape pipe through the hole at the bottom of the container.

There are two containers, one nesting in the other for transport. These containers are used alternately and thus allow continuous work with brief intervals for changing the containers and replenishing the water in the boiler.

The capacity of the container is: A container, eleven blankets folded; B container, ten blankets folded. This refers to blankets in normal use.

The containers have a false bottom of expanded metal to allow condensation water to escape without wetting the bottom blanket.

Method of Use.

(1) *Heating.*—(a) If the Jubbulpore G.C.F. burner is used for heating, the disinfector is placed on a piece of smooth ground and a short trench is made 2 feet long by 1 foot wide and with a bottom sloping up at an angle of 30° towards the arched entrance of the fire box. Into this the burner is placed pointing up into the fire box. This throws the flame of the burner upwards along the whole length of the base of the boiler. The front portion of the burner, as far as the hood, should project into, and be protected by the fire box arch. (b) If a wood or coal fire is used, a trench fireplace is made as for a field kitchen and the disinfector placed over it. If the burner is placed at the opposite end to the steam escape, or if stoking is done from the opposite end, then the steam escape will not hinder stoking operations, but hot gases from the other end of the fire box tend to mask the steam coming from the escape pipe and make it more difficult to take the time for full steaming. On the other hand, if the apparatus is placed the other way round care is required to avoid the steam escape when stoking or manipulating the burner.

(2) Open the lid by unscrewing the clamps and remove the containers A and B.

(3) Pour in water so that it covers the cross bar (five gallons approximately).

(4) Light the heater or fire and get the water boiling vigorously.

(5) Lift container A, packed with material to be disinfected, by the special handles and place into the steam-box. Short side to side movements may be required to ensure that the T-piece of the escape pipe has fitted into the hole at the bottom of the container, and to ensure that the container is firmly seated on the washer round the T-piece of the escape pipe.

(6) Clamp on the lid, taking care that the lid is seated properly all round so that the sides of the box engage with the asbestos or fibre rope packing of the lid.

(7) After six to ten minutes, steam will be seen spouting from the steam escape pipe and a definite whistling noise is heard.

(Note.—Whisps of steam will appear some time before this and should be disregarded. A definite spout of steam indicates that the container and chamber is filled with steam.)

(8) Allow steam to spout five minutes.

(9) Undo the lid-clamps. Those furthest from the heater should be undone first or the heater may be extinguished by the escaping steam.

(10) Remove the lid.

- (11) Lift out the container with the special handles and place it on the loading area.
- (12) Place container B, loaded with material to be disinfected into the steam box, and steam the contents.
- (13) Unload container A.
- (14) Reload container A, ready for steaming when B is finished.
- (15) Repeat the process, using A and B alternately.
- (16) At each change over add a small quantity of water to the boiler. This will allow the process to be continued without unnecessary delay for the reboiling of the water in the boiler.

NOTES.

Loading containers (blankets).

The blankets should be folded in half, bringing end to end ; then in half again, bringing edge to edge ; then folded in thirds leaving the corners exposed. The blankets folded thus are placed flat in the container with the exposed corners uppermost to allow easy removal in unloading.

By this method of folding the full number of blankets can be loaded, provided the blankets are not brand new.

Unloading containers (two men required).

Each man seizes the uppermost exposed corners of the top blanket, and pulls the blanket out to its full extent.

The blanket is then vigorously shaken to remove all steam, and will be found to be practically dry.

If blankets are removed from the container without shaking they will be wet.

Water.

A half to one gallon of water may be added at each reloading. Do not fill with water above the level of the cross bar.

Method of packing for Transport.

Remove water from boiler.

Place container B upright on the ground.

Place container A upside down over it. Then invert the whole and place container A, with the other nested in it, into position in the chamber, placing the handles on to the upturned bottom of container B where the sloped surface allows room.

Close and fasten the lid.

The outside of the disinfector and all inside parts wetted by steam should be wiped over with an oily rag after use to prevent rust. The inside of the containers should not be oiled. Clamp-swivel pins and clamp sockets and handles should be slightly greased.

The Ds attached to the clamp swivel pins are intended for use for pack transport on camels.



Editorial.

THE REPORT OF THE MEDICAL RESEARCH COUNCIL FOR THE YEAR 1935-1936.

THE Council heard with great pleasure of the award of the Nobel Prize in Medicine for 1936 jointly to Sir Henry Dale, Director of the National Institute for Medical Research, and to Professor Otto Loewi of the University of Graz, in recognition of their work on the nature of the chemical mechanism involved in the transmission of nerve impulses.

In 1914 Sir Henry Dale found acetylcholine in some samples of ergot and its extraordinary potency in stimulating the parasympathetic nerve-endings and its rapid destruction in hydrolysis suggested that it might have physiological importance. Between the years 1921 and 1926 Professor Loewi showed that the vagus probably acted on the heart by first liberating acetylcholine at the nerve-endings. In 1929 Dr. H. W. Dudley found that acetylcholine was a normal constituent of an animal organ. Later, Sir Henry Dale and his colleagues, Dr. Gaddum, Dr. Feldberg and Dr. G. L. Brown showed that acetylcholine is not only the chemical transmitter of vagus impulses to the heart muscle but that the same mechanism is responsible for all parasympathetic nerve activities and also for sweat secretion. In the past year they have established beyond doubt that acetylcholine is the medium through which motor nerve impulses activate voluntary muscle. It seems probable that the transmission of most efferent impulses throughout the peripheral nervous system is dependent at some stage or other on this chemical action.

For some years the Council have advocated research on the clinical aspects of medicine and have assisted in the establishment of senior clinical posts on a whole-time basis. Clinical research in medicine and surgery has been handicapped by the fact that careers in these subjects have been too closely dependent on success in private practice. The Council, therefore, consider that Lord Nuffield's munificent gift of £2,000,000 to the University of Oxford for research and post-graduate teaching in medical science has been an event of outstanding importance and warmly welcome the new proposals.

At Cambridge a department of clinical research has been established under the direction of Dr. T. A. Ryle.

The Council themselves have offered six post-graduate studentships for medical graduates who have held house appointments and are strongly inclined to a career in clinical science or experimental pathology. They have also offered four research fellowships for candidates of similar qualifications who have already had some experience in the use of research methods, and it is expected that in the future post-graduate students will thereafter pass into this senior category. Those who do well while holding these fellow-

ships may be considered for posts in the Council's service and should find themselves well qualified for academic appointments which are becoming available in increasing numbers.

Investigations on influenza have continued during the past year and substantial progress has been made. The critical experiment of transmission of the disease from an infected ferret to a human being has now been made accidentally in the person of Dr. Stuart Harris. Virus originally obtained from a human case, but since passed through 196 ferrets, was used to infect a small batch of ferrets. One of these, when heavily infected, sneezed violently at close range while it was being examined by Dr. Stuart Harris. After forty-five hours he had a typical sharp attack of influenza. Washings from his nasopharynx up to the fourth day were directly infective not only for ferrets but also for mice. Fortunately a specimen of Dr. Stuart Harris's blood-serum, taken before the attack, was available for examination; this was found to contain no demonstrable antibody for the virus of human influenza. There were indications of such antibody quite early in his attack, but on the eighth day, when the symptoms had subsided, it was strongly developed, and still more strongly on the sixteenth and thirty-first day, after which it underwent a slow decline. This experience provided the important link completing the chain of evidence for the identity of the virus, maintained for over two years in ferrets, as the cause of human influenza; it also provided evidence of the connexion between the virus-neutralizing antibody in the blood and resistance to infection.

The possibility of immunizing man against influenza is more hopeful. Dr. Andrewes and Dr. Smith have produced from the virus a vaccine of sufficient potency and purity to be tested as to its immunizing value for the human subject. By successive passages through mice a virus of such potency has been obtained that the filtrate from the lungs of infected mice is able in a dilution of 1 : 10,000,000 to infect a mouse. It has been found that this virus can be made completely non-infective without appreciable loss of antigenic value by treatment with very weak formaldehyde. It may be noted that the virus in the living state is apparently innocuous when given by hypodermic injection and that it is being used in this way for immunization trials in the United States. By Dr. Elford's method of selective ultra-filtration it has been possible to free the virus from a number of extraneous substances in solution. This purified vaccine causes in the mouse not only the appearance of antibodies in the blood, but also confers a substantial resistance to infection by the respiratory passages. It remains uncertain whether the amount of antibody circulating in the blood as the result of vaccination in the human subject will confer a significant degree of resistance to naturally acquired infection, and if its immediate effect is to produce a definite resistance. It will be necessary to know the duration of the protective action before an assessment can be made of the practical value of the method.

The popular interest in nutrition continues to grow and the Council consider the most significant action which emphasizes the new importance attached to nutrition is the recent announcement that His Majesty's Government is determined to regard the improvement of physical fitness as a fundamental point of policy. At first this policy was largely interpreted by the public from the angle of physical exercise, but discussions in Parliament and in the press have shown that proper nutrition is considered of even greater importance. It is realized that an improperly fed animal cannot profit to any great extent by opportunities of physical exercise. The foundations of good physical development and health are laid down in infancy and childhood and are largely dependent on good feeding.

In a section on "What People in this Country Eat," the Council draw attention to the most recent report by Professor Cathcart and Mrs. Murray which deals with the actual food eaten in St. Andrews, Cardiff, and Reading, in the course of everyday housekeeping. The results of studies of the type of food eaten by a number of Glasgow families, and also by some women students, have been added to those obtained in the other localities. In Current Literature of the June number we have given a précis of the main points in the report. We noted the constancy of the percentage intake of protein and of the calories eaten by people living far apart, and that this is obtained independently of the kind of foodstuff eaten and seems to represent the result of some kind of instinct.

Professor Cathcart and Mrs. Murray calculated that the actual percentage of calories of food lost by the housewife as refuse and waste in St. Andrews was only 2·6 per cent, but whether the same holds throughout the country is doubtful. Ten per cent is the figure usually given.

Few of the diets examined when considered from the standpoint of energy, protein, fat, percentage of first class protein and mineral salts, could be regarded as really poor. As regards the protective foods many of the diets left much to be desired. It was not entirely a question of the money available as it was noticed that some of the poorest people made a better selection of foods than others with larger incomes.

Professor Cathcart and Mrs. Murray lay great stress on the necessity of educating the average housewife on the relative nutritive value of different foodstuffs by personal contact and by demonstrations in which the cooking utensils are those which the housewives have at command at home.

For many years discussions of food have centred round the calorie value of the diet and the figure of 3,000 calories per man assumed the position of an absolute standard. More recently the figure has been raised to 3,400 calories and diets below this value have been regarded with suspicion. Professor Cathcart and Mrs. Murray, however, found that the daily diet of 109 women students, average age 21, contained only 2,035 calories per person and the general physique and health of these women was reported to be very good. The League of Nations Technical Commission on

Nutrition decided that a daily allowance of 2,400 calories is adequate for the needs of an adult, male or female, living in a temperate climate and not engaged in manual work. The figure 2,400 is *net*; the Commission gave no figure for waste.

The Council consider that probably the limiting factor in a large section of the community is food-purchasing power. In any steps to improve the physical fitness of the community both aspects of the problem, the educational and the economic, must therefore be dealt with. Above all, it must be remembered that the feeding problem is of the greatest concern to the young and adolescent.

The chemical composition of British foods, particularly cooked foods, and the losses they undergo during cooking, have been investigated under the direction of Dr. R. A. McCance at King's College Hospital. Before the inception of this work there were very few analyses of cooked foods and throughout particular attention has been paid to the fact that chemical analysis of a food may be misleading as a guide to its nutritional value. This is particularly the case with the carbohydrate, with calcium and phosphorus contained in plants, and with the iron in all foods. Methods have accordingly been devised to distinguish between the fractions of these constituents which are available for nutrition and those which are not.

The investigators have compared the old data with the new, and in the course of the work it has been found that many of the accepted theories about cooking are not supported by experimental evidence. It has been shown that it makes no difference to the losses whether meat is plunged into boiling water at the start or placed in cold water and slowly brought to the boil. Although vegetables lose nutrients rapidly when they are cooked in cold water, they may be soaked and washed in cold water in the raw state without loss.

The authors of the report have applied their own figures to a study of the individual food intakes of men and women of the middle class and have discovered that the iron intake of women is much lower than that of men. The iron requirements of women, particularly during the child-bearing age, are clearly so much greater than those of men that the authors were led to investigate the matter further and have found that many of the so-called normal women of the middle-class are suffering from a mild degree of anæmia.

The Council refer to the three reports on the influence of diet on the development of the teeth by Mrs. Mellanby which they have published. In order to test the conclusions arrived at as the result of Mrs. Mellanby's studies, the Committee of the Council had to be content with a trial over a restricted period on children living in institutions where the diet could be regulated to a more or less standard pattern and to superimpose the factors it was desired to test on different groups of children under observation. The results convincingly supported Mrs. Mellanby's findings on the beneficial effect of vitamin D in inhibiting the initiation and spread of

caries in the teeth. The Council state that according to our present knowledge the most promising method of improving the dreadful situation presented by the dental condition of this country is to increase the intake of those foods which benefit dental structure and resistance, and reduce those which either actively or passively result in the development of defective teeth. This means practically increasing the consumption of milk and other dairy and market-gardening products, and reducing the consumption of bread and other cereals, especially in the earlier years of life.

In their last Annual Report the Council drew attention to the problem of sepsis in childbirth, and particularly to the report by Dr. Dora Colebrook. They now state that any drug that will have a beneficial action on the infection due to hæmolytic streptococci, which until recently killed annually 1,200 women in the full vigour of life, must have great importance. Two papers by Dr. Leonard Colebrook and his colleagues at Queen Charlotte's Hospital, London, suggests that "red prontosil" and "soluble prontosil" have such an effect. The Council consider that more clinical and laboratory tests are necessary before an accurate appraisalment of the situation can be made. An additional reason for delaying judgment is that present experiments promise even better results with the colourless substance para-amido benzene sulphonamide, with which clinical tests are now being made at Queen Charlotte's Hospital.

Before the introduction of the prontosil compounds, from 1931 to 1935, 495 cases of puerperal sepsis entered Queen Charlotte's Hospital; of these 112 died, giving a fatality rate of 22·7 per cent. In part of the year 1936, 64 cases of puerperal sepsis have been treated with "red prontosil" and "prontosil soluble" in the same hospital; of these only 3 have died, giving a fatality rate of 4·7 per cent. Apart from the reduction of mortality, Dr. Colebrook noticed a sudden reduction in the severity of the peritonitis associated with puerperal sepsis in the cases treated with prontosil, also in no case has a patient developed palpable pelvic or abdomino-pelvic mass or abscess after the beginning of treatment, although this used to be the commonest complication of puerperal infections caused by hæmolytic streptococci.

During the year the Council have issued two reports dealing with the subject of deafness. The accurate study of deafness is stated to be a product of the great advances in sound reproduction and recording associated with telephone engineering and broadcasting.

The success obtained in amplifying sound alone has not solved the problem of defective hearing, as might have been hoped. It appears that individual deaf persons vary in the extent to which they are deaf to different pitches of the auditory range. The object of any hearing aid is, therefore, to modify the sound so as to bring it within the range of hearing which the individual retains.

According to Manchester workers the results of testing deaf persons for a series of pure tones by means of the audiometer provided a reliable index of the intelligibility of speech to the deaf listener. Special attention was given by these workers to the type of amplifying apparatus which gave the best results in deafness, and also to the relative merits of teaching groups of children by a class amplifier or by an individual aid for each child. It was decided that the class amplifier has definite advantages over individual aids.

As a result of an experiment with forty-eight deaf children in London Dr. Kerridge has estimated that of the partially deaf, i.e. those who can hear a conversational voice from two to twenty feet away, 97 per cent would benefit greatly by hearing-aids: whereas among deaf children who cannot hear the conversational voice as far as two feet away, 51 per cent would derive considerable aid from sound-magnification instruments.

Certain workers in the cotton industry especially those known as strippers and grinders are particularly susceptible to a disabling chest trouble due to the inhalation of cotton dust. Clinical examination of these workers reveals the presence of bronchitis and emphysema. The death-rate from bronchitis among male cotton strippers between the ages of 20 and 60 is five and a half times greater than that for all occupied and retired males and ten times greater than such dusty occupations as cement workers and lime burners.

Dr. I. C. Bramwell and Dr. R. Ellis examined for the Council many cotton operatives suffering from cardio-respiratory symptoms believed to be due to the inhalation of cotton dust. The results suggested that some form of sensitization played an important part. Subsequently Professor H. B. Maitland and Dr. A. Browne discovered the unsuspected presence of histamine in the cotton dust. Professor Karl Prausnitz, a distinguished investigator in industrial medicine, was appointed by the Council to follow this clue. The work was done in Professor Maitland's department in the University of Manchester with the co-operation of the employers organizations and trade unions concerned. Prausnitz found the most dangerous particles of cotton dust were those under two microns in diameter which in spite of better systems of ventilation still gained access to the workers' lungs. The fatty fraction of the particles was found to be harmless, but the protein fraction contains some toxic factor which is probably responsible for the respiratory trouble. The workers affected by the disease are hypersensitive to the protein of the cotton dust. Although hypersensitivity is an important factor in the disease Professor Prausnitz did not find that de-sensitization held any promise for improving the condition. The crux of the problem is the exclusion of the minute particles of dust, and since present methods of ventilation do not exclude these particles the solution of the problem depends either on the adoption by the workers of suitable respirators or on the application of some new means for collecting the smaller particles before they enter the general air in the room.

Clinical and other Notes.

A CASE OF CHOLEDOCHO-DUODENOSTOMY.

BY MAJOR K. FLETCHER-BARRETT,
Royal Army Medical Corps.

THE following case is published as it is thought that it may be of interest in view of the unusual anatomy of the parts and the final success of the operation. It was one of three cases of cholelithiasis in officers upon whom I operated in the course of one month; both the others conformed to more or less normal anatomy. Incidentally in all these cases the gall-bladder did not fill when examined by X-rays, using "Shadocol," although the diagnosis was confirmed at operation in each case. One gall-bladder contained three large stones and the other two were full of numerous small ones.

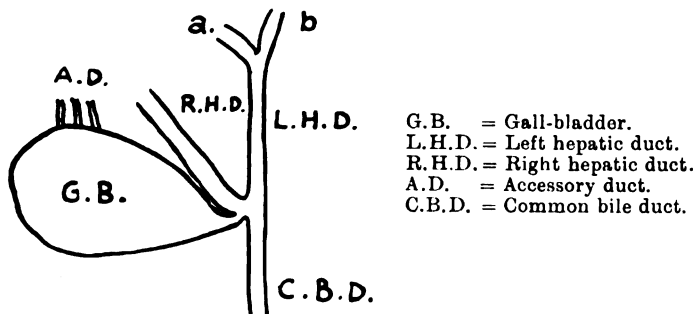


DIAGRAM 1.

Case Report.—Colonel C. was operated upon on May 13, 1936, for cholelithiasis. The gall-bladder was exposed through a paramedian incision; it was found to be partly embedded in liver tissue. I traced the neck of the gall-bladder down to what I thought was the common bile duct and followed this up to the liver, where it appeared to bifurcate close to liver tissue (*a* and *b* in Diagram 1). These I took to be the right and left hepatic ducts. The cystic artery was then isolated and ligatured. The neck of the gall-bladder was ligatured and the gall-bladder removed: in doing this, I noticed several fine strands of tissue running between the gall-bladder and the liver—these appeared to be accessory ducts, although there was no leakage of bile from them, probably because I had clamped them as I stripped the gall-bladder away.

When making a final inspection before closing the abdomen, I discovered a moderately-sized duct which had been ligatured with the cystic artery. A drainage tube was put to the site, and the abdomen closed in the usual manner.

After the operation, I examined the gall-bladder and was doubtful concerning the anatomy at its neck owing to this part having been crushed

in the clamp. My assistant, Captain K. H. Clark, Royal Army Medical Corps, had drawn attention to the moderately-sized duct before closing the abdomen, but as I palpated apparent ducts *a* and *b*, I thought this to be an accessory duct. This eventually turned out to be the right hepatic duct.

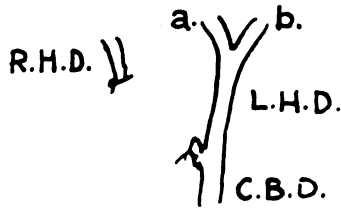


DIAGRAM 2.

Twenty-four hours later, the patient developed jaundice; there was no leakage of bile through the tube to the surface. As the jaundice was increasing, I re-opened the abdomen, forty-eight hours after the first operation, to find the condition of affairs shown in Diagram 2. It was then obvious that the right hepatic duct had been ligatured: it had also shrunk a marked distance towards the liver.

I found that the two cut ends would not approximate, so I decided to try to implant the upper end into the duodenum. This was extremely difficult, but eventually I managed to get a small portion of the duct into contact with the duodenum, using a small rubber tube as an internal splint. An external drainage tube was put down to the site of this extremely fragile anastomosis, and the abdomen closed.

The drainage tube was removed ten days later, and there was an external discharge of bile for about three days. This healed, has since remained healed, and the patient was discharged from hospital to duty one month after the date of the original operation.

It is now ten months since the operation, the patient is fit and has done full duties ever since his discharge from hospital. He has put on weight, but has occasional slight twinges of pain which are relieved by alkalies, and which he notices to come on after strenuous exercise or eating certain foods, particularly nuts. These are not sufficient to incapacitate him; he is playing golf and tennis regularly, and rides as his duties necessitate. A recent X-ray showed no signs of the splinting tube, so this has been passed presumably per rectum, although no sign of it has been seen by the patient.

I think that the ultimate success of this operation is due to not delaying in reopening the abdomen immediately it was discovered that jaundice was increasing.

I am indebted to Lieutenant-Colonel J. B. Jones, M.C., Royal Army Medical Corps, Commanding British Military Hospital, Ranikhet, for permission to send this case for publication.

A CHEAP SANITARY TRAP.

BY LIEUTENANT-COLONEL J. O. CHUKERBUTI,
Indian Medical Service.

A.—REQUISITES.

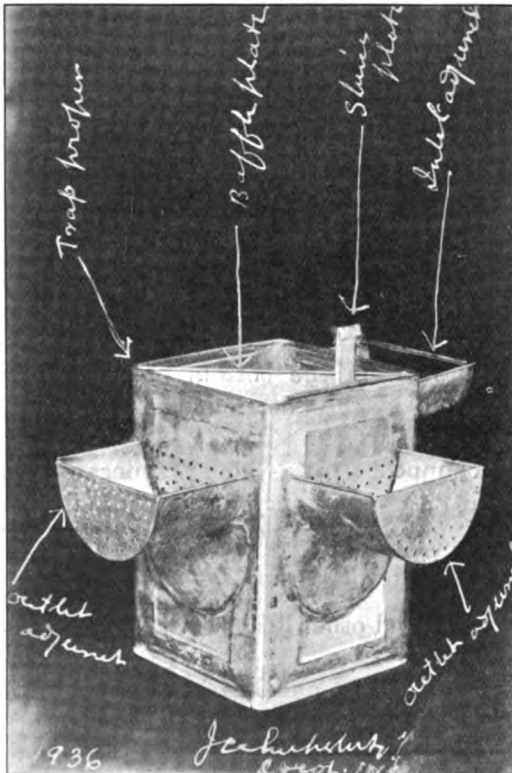
(1) A KEROSENE oil or ghee tin ; (2) Five pieces of small tin sheeting ; (3) Chopped dry straw ; (4) Some powder consisting of sixteen parts of copper sulphate and six parts of lime.

B.—GENERAL DESCRIPTION.

(a) *Method of Construction.*

(1) Cut off the cover on one end of the kerosene oil or ghee tin ; this coverless tin is the *trap proper*.

(2) Solder cornerwise inside the trap a piece of tin sheeting from a quarter of an inch above the top to an inch above the bottom, dividing thus



the trap into two triangular equal chambers ; this sheeting is the *baffle plate*.

(3) Cut a semi-circular hole about two inches below the upper border of one side of a chamber, solder a trough along the margin of the hole,

strengthen the free end of the trough by a cross-bar ; this trough is the *inlet adjunct*.

(4) Solder three inches below the upper border of the trap proper and along the margins of the perforated semi-circular areas two larger troughs with perforated outlets on either side of the other chamber ; these are the *outlet adjuncts*.

(5) Inside the chamber on the side of the outlets and on either margin of each perforated area, make linear sockets with strips of tin to hold tightly, when pressed down, a sheet of tin with a handle ; this sheet is the *sluice plate*.

(b) *Method of Using.*

(1) Put the trap into a "kucha" or "pacca" pit at the end of the drain.

(2) Adjust the inlet under a ledge fitted at the end of the drain.

(3) Keep the trap in position by weights, cementing or fasteners.

(4) Close the inner end of one outlet adjunct by adjusting the sluice plate.

(5) Fill the other outlet adjunct with chopped dry straw ("Bhusa") mixed thoroughly with the lime plus copper sulphate powder, in the proportion of a drachm of the powder to one ounce of straw.

(6) Run in the sullage by the inlet adjunct into the trap proper.

(7) Let the effluent run out into absorptive gardens or herring bone systems.

(8) Alternate the direction of the effluent by one or the other outlet adjuncts into different absorptive areas whenever desired to facilitate quick evaporation and absorption.

(9) Clean the debris from the bottom of the trap proper whenever required, otherwise the passage under the baffle plate will get blocked and the trap will be put out of action.

(10) Put fresh chopped straw whenever necessary into the outlet adjuncts otherwise filtration and precipitation will fail sooner or later.

(c) *Processes Involved.*

(1) *Separation* of fat and other floating matter by the baffle plate in the inlet chamber.

(2) *Sedimentation* of coarse and heavy particles in the inlet chamber and of fine particles in the outlet chamber.

(3) *Filtration (coarse)* through the medium of chopped straw in the outlet adjuncts.

(4) *Precipitation* of soap and greasy matter in colloidal suspension by lime plus copper sulphate powder in the outlet adjuncts.

(5) *Alternation* of the direction of the effluent through outlets by means of the adjustable sluice plate.

C.—ADVANTAGES.

(1) Absorption of the effluent in the fruit and flower gardens is facilitated by absence of clogging.

(2) There is a retardation of growth of organisms and of some mosquito larvæ by the alkaline property of the effluent.

(3) There are no unpleasant malodorous effluvia of decomposed fat, food particles and other organic matter in the effluent channels.

(4) Tins can be obtained at public expense for sanitary purposes and construction charges do not exceed six or seven annas per trap.

(5) In Indian Cantonments like Ferozepore and Multan where soakage pits are not advisable on account of the sources of drinking water supply being shallow, open, or tube wells, not more than thirty feet deep, and where the level of sub-soil water is very high—six feet in certain localities—and consequently waste water has to be disposed of in absorption areas, this trap is considered useful. It has been in use for some time in Ferozepore, Multan and Jullundur Cantonments and has proved satisfactory.

(6) The size of the trap can be altered and materials for construction selected to suit the need for disposal of different amounts of sullage in British and Indian lines and according to the size of the effluent drain.

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A FEW HISTORICAL FACTS ON ANTISEPSIS IN
OBSTETRICS AND GYNÆCOLOGY DURING THE LAST
CENTURY.

By MAJOR C. E. ECCLES,
Royal Army Medical Corps.

BEFORE the advent of Listerism, it was said that the usual death-rate from child-bed fever in Lying-in Hospitals was from 2 to 10 per cent, and in so called "epidemics" this limit was often exceeded. In the women who survived, feverless child-beds were comparatively low.

Under the antiseptic methods adopted at this time, the mortality from sepsis in well managed institutions was less than 1 in 200, and the morbidity did not exceed 10 per cent.

Norris and Dickinson, writing in 1897, gave the following examples to show what was possible under the present perfected system of aseptic obstetrics:—

Professors Groth, Netzel and Sonders, of Stockholm, reported 17,862 births under their direction, with one death in 344 cases infected.

In Copenhagen, in 1,218 hospital deliveries, the death-rate was 0.24 per cent.

The Boston Lying-in Hospital, in 1891, recorded 550 deliveries with no death-rate from septic causes.

In the New York Maternity Hospital, 957 women were delivered without a death from septic causes.

In pre-antiseptic times the puerperal mortality was much greater in public institutions than in private practice.

Obstetric antisepsis dates from 1847, and to Ignatius Semmelweiss, a young Hungarian, who at that time held the position of assistant in the Lying-in Hospital at Vienna, belongs the credit of first demonstrating its efficacy.

The obstetric service of the hospital was divided into two sections; in one instruction was given to midwives, in the other instruction was given to the medical students. It was with the latter section that Semmelweiss was connected.

The students in this department were at the same time working at practical anatomy and practical pathology. The women were delivered by students who for a considerable portion of their time were performing post-mortems and carrying out dissections on the cadaver. The only precaution they took was to wash their hands in soap and water, and they made examinations very frequently.

The death rate was excessive, reaching nearly 10 per cent of the women delivered. Horrified at this frightful mortality, Semmelweiss bent his energies to find the cause. He was struck with the fact that in the midwives section the death-rate was only three in every hundred women confined. The records showed also that women delivered before admission nearly all escaped. It appeared, also, that prolonged labours in the students' section were almost invariably followed by death, while in the midwives' section the length of the labour made very little difference in the mortality.

During the time that Semmelweiss was engaged in his investigations, Professor Kolletselke, one of his associates, lost his life following a dissection-wound. The symptoms of his colleague's illness were similar to those of the fatal malady which was raging in his own wards. He was impressed with the identity of the two diseases, and it dawned upon him that the cause of the deadly scourge might be found on the hands of the students who attended the labours.

In May, 1847, he established an order that students before taking charge of a case should wash their hands in chlorine water or in a solution of chlorinated lime, and he restricted the number of examinations. The result of this was an immediate fall in the death-rate. In six months the mortality rate had dropped from 9 or 10 per cent to 3 per cent. His views were bitterly opposed by the profession and he struggled in vain for the acceptance of his theory. He was ridiculed and despised, and finally died insane, the victim of continued persecution.

Soon after its introduction into surgery by Sir Joseph Lister in 1866, antisepsis began to gain a permanent hold in obstetrics. First adopted in 1870 by Stadfeldt of Copenhagen, it was taken up by the principal lying-in

hospitals of Europe, and in 1897, with many improvements in the technique, it was universally practised in the lying-in hospitals all over the world.

The following is a description of the preparation of a case of curettage in 1897 :—

For cleaning the vagina, laundry soap and a 10 per cent solution of creolin, or a $1\frac{1}{2}$ per cent lysol solution, with a long handled (sterilized) brush will suffice.

By pushing the brush in and out, turning it, scrubbing here and there, the vagina may be rendered aseptic. While engaged in using the brush, irrigation into the vagina may also be made.

The cleansing should be as thorough as possible, going over and over the field time and again. The vaginal canal should be scrubbed in this way whenever an operation is being performed upon or through it. In septic cases especially must it be thorough.

I think it is rather interesting to compare the above with the present-day methods, and to see what a tremendous advance has been made in aseptic midwifery and gynaecology.

Echoes of the Past.

WAR EXPERIENCES OF A TERRITORIAL MEDICAL OFFICER.

BY MAJOR-GENERAL SIR RICHARD LUCE, K.C.M.G., C.B., M.B., F.R.C.S.

(Continued from p. 59).

CHAPTER XXV.—PREPARATIONS FOR THE FINAL ADVANCE.

As the summer advanced and the reorganization of the divisions approached completion, it was obvious that we were working up for another offensive. New roads had been made to the less accessible parts of the line. A Decauville railway was run out from Jerusalem to Ramallah. The new troops were practised in the attack of positions by a series of well thought out and carefully rehearsed raids. The medical organization for evacuation from the front line was revised. The field ambulance transport was overhauled and the long-expected mule litters were added to their establishment. Our new Indian field ambulances were practised in field work and collection of wounded.

It was soon seen that the rôle of the 20th Corps in the great operation would be a subsidiary one, though the fact was carefully kept secret from all but the heads of departments. Deception of the enemy as to the part of the line on which the attack would be made was the most important factor in General Allenby's scheme. All through the long months after the capture of Jerusalem the idea of hoodwinking them on this point was ever

before him. The retention of troops in the almost impossible Jordan Valley, the two raids across the Jordan into Moab, all had the primary object of diverting the enemy's attention to this flank. And there is no doubt that he fully succeeded in deceiving them. To the last they had no idea where the main attack would be, though they knew of course that it was coming somewhere. The wonderful concentration of troops on the maritime plain between the hills and the sea was a complete surprise. Their most recent intelligence reports and maps, captured at Nazareth after the advance, gave no hint of any knowledge of it.

In the scheme, the 20th Corps were to hand over their best fighting division, the 60th, to the 21st Corps. Our own attack was to be a subsidiary one. Our rôle was to hold the enemy to their positions on the



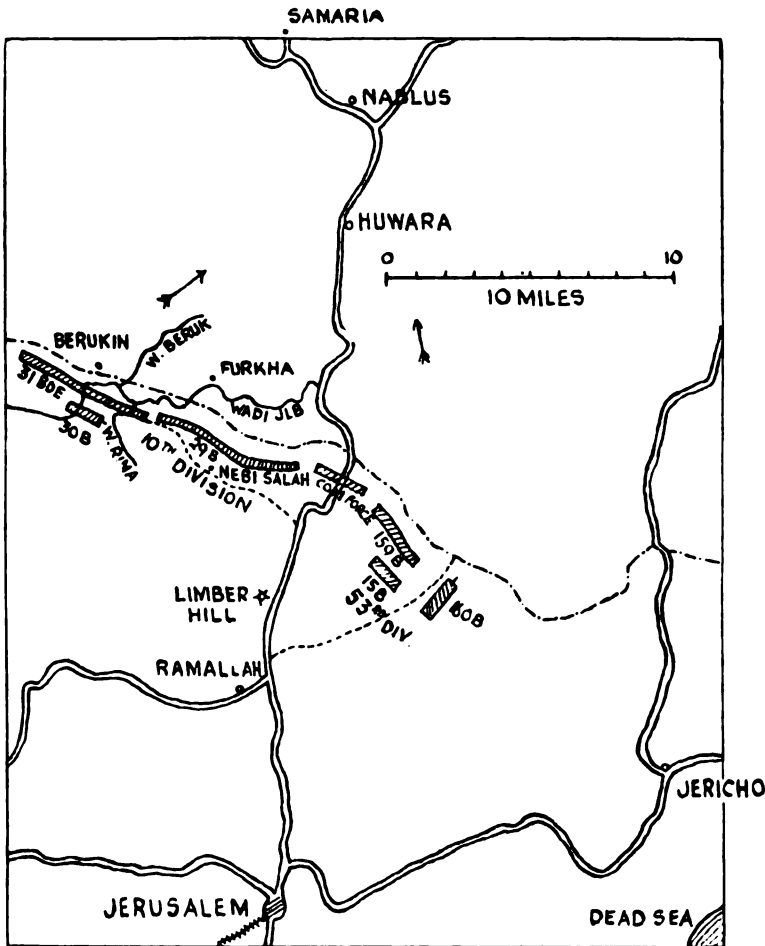
Practising with mule litter, Judean Hills.

hills and to advance our line in conformity with the movement on our left. Our plans were none the less worked out in the utmost detail. The scheme involved a converging attack from the extreme flanks by the two remaining divisions, the 53rd and 10th, while the centre was held by a composite independent retaining force.

The 53rd Division was on the right and the 10th on the left. Both had strong enemy positions in front of them and each was to concentrate behind its outer flank, leaving the intervening space weakly held by the composite force. The attack was to be launched simultaneously by the two divisions, after the attack by the 21st Corps had started in the plain. After taking the positions immediately in front of them they were to advance, converging towards the Nablus Road which was to be struck about six miles on, when a direct advance was to be made on Nablus.

The Jerusalem—Nablus road was the only permanent one crossing the two lines. It occupied almost the middle of the Corps position. The roads out to the flanks of the divisions were new military roads, roughly and recently made, and for the most part in bad condition. They only went up to our position and had no continuity with any similar track on the Turkish side.

POSITION OF 20TH CORPS, SEPTEMBER 18, 1918.



The nature of the operation made the business of evacuation of the wounded a very difficult one.

It was evident that as the attack developed there would have to be a change in the route of evacuation. At first it would be by the tracks leading out to the flanks of our position, but as the two attacking forces converged the line of evacuation would be shortened by making use of the

central permanent road running through the two lines. The country beyond the flanks was little known. It was extremely rough and hilly and broken by deep wadis running down east and west to the Jordan plain on the one hand and the maritime plain on the other. On the left flank the attack would be made over ground previously held by the right flank of the 21st Corps. So strict were the instructions as to secrecy that Directors were forbidden to take even their immediate assistants into their confidence. Any investigation of routes and reconnaissance necessary in the early stages had to be made personally and alone.

One such reconnaissance may be referred to. Our front line roughly coincided with a deep wadi running west, known in its upper part as the Wadi Jib, and further down as the Wadi Balut. It starts at the Nablus—Jerusalem road, which is practically on the water parting. At its upper end our front line positions were to the north of the wadi but there was a part of the line opposite the left half of the 10th Division, where they were behind the wadi, and in direct view from the Turkish positions, especially from the prominent village of Furkah. The position on the extreme right flank of 21st Corps, held at this time by the 75th Division,¹ was again in front of the wadi. Our extreme left post was at Nebi Saleh and between this and the 75th right post at Berukin there was a gap. The attack of the 10th Division would pass through Berukin and the only possible route of advance and of subsequent evacuation was by a tributary of the Wadi Jib called the Wadi Rima, running into it from the south, then along the Wadi Jib to the west for about a quarter of a mile, as far as the Wadi Beruk opening into the main wadi from the north. The two miles down the Wadi Rima were well under cover, but the quarter mile of the main wadi was quite open to view from Furkah and from the more forward Turkish posts. It was essential to discover if this route could be used by motor and horse ambulances during the operation. One very hot afternoon, therefore, I set off to explore the route, leaving my car at the top of the Wadi Rima. It was quite simple until one got to the opening into the main wadi. There one was confronted with a double risk, firstly that of being spotted from the enemy's positions and secondly, as one emerged into the territory of the 21st Corps with whom there was little or no communication, that of being taken for a spy coming apparently from the Turkish side. However, all went well and by creeping along under cover of what scrub there was, I escaped observation and when I came out into the part of the wadi belonging to the 21st Corps, no notice was taken of me by anyone. Having made all the investigations I wanted and having proved the practicability of the route for our purpose, I returned the way I had come, to my car.

To serve the 20th Corps in this operation there were four Casualty

¹ Before the actual operation the 75th Division was moved nearer the coast.

Clearing Stations, three in Jerusalem and one, the 74th, on the Nablus Road at Limber Hill, about twelve miles north of Jerusalem. With this was also an Egyptian hospital, available also for prisoners of war.

It was arranged that the wounded should pass through the 74th Casualty Clearing Station and thence to Jerusalem. Medical cases were to be held up during the operation and sent to divisional retention hospitals which had for some time been established at Ramallah for the care of minor cases of sickness, staffed by personnel from field ambulances of the respective divisions.

For each division there would be two successive routes of evacuation. Firstly, through main dressing stations placed close behind the extreme flanks on the roads leading out to the flanks. Secondly, through main dressing stations to be formed on the Nablus Road as far forward as might be convenient. For this purpose one section of a field ambulance from each division was kept on the Nablus Road behind the centre of the line, ready to advance as soon as the road was open for them and the convergence of the divisions had made this the more direct route for evacuation.

In the case of the 10th Division an arrangement was also worked out for the evacuation of lightly wounded cases by the route which had previously been used by the 21st Corps for the evacuation of the casualties from their extreme flank, direct to Ludd. They had a light railway running up from Ludd into the hills, to within five miles of the point of junction of the two corps. It was, therefore, a much shorter route to railhead than round by Jerusalem, but its use involved diversion of part of their transport by the field ambulances on that flank which in the event proved too much for them. Only about sixty cases were sent down that way as it was found that the journey from the advanced dressing station to the head of the light railway and back took five hours. Advanced dressing station parties and bearers were to accompany the attacking brigades to be employed at the most suitable spots to be selected by the Divisional A.D.s.M.S.

The light railway from Jerusalem to Ramallah, just completed, was to be used for evacuation of walking cases direct to Jerusalem without passing through the 74th Casualty Clearing Station. To superintend the loading of the trains at Ramallah a small detachment was detailed with tentage and equipment for housing and feeding parties before they were dispatched.

The Divisional A.D.s.M.S. were made responsible for the evacuation of casualties as far as the main dressing stations; the Corps D.D.M.S. for evacuation from the main dressing stations to the casualty clearing stations in Jerusalem, where they were taken over by the A.D.M.S. Line of Communications. The D.D.M.S. also took over temporary control of the divisional retention hospitals for medical cases at Ramallah.

A special operating unit consisting of two medical officers, one of whom was a surgical specialist, was attached to the Corps for the operation and was detailed to the main dressing station of the 10th Division at Nebi Saleh on the left flank.

As the country in front was unsuitable for motor ambulances, only six Ford cars were placed at the disposal of the divisions, the whole of the rest of the motor ambulances were administered by the D.D.M.S. for evacuation from the main dressing station to the casualty clearing stations. Communication between the D.D.M.S. and the A.D.M.S. and between the A.D.sM.S. and their field ambulances was maintained by motor cyclists, two being attached to the former and one to each of the latter. Reports were sent by the divisions to the D.D.M.S. every six hours.

The distances were very great. Nebi Saleh was about ten miles from Ramallah and the first objective of the 10th Division was at least five miles further. The distance to the right flank was not quite so great, but the country was even more difficult than that on the left.

Careful instructions were given to ensure promptitude in getting away serious cases and to prevent delay in the use of motor ambulances, also as regards the methods of sanitation to be employed during the advance. Corps headquarters was to move from Jerusalem to Ramallah on the day of the commencement of the operation.

The great event was fixed for September 18. Our hopes were high. The health of our troops was good, and their morale at the highest pitch, while it was known that those of the enemy were both at low ebb. Desertion had been increasingly frequent and everything pointed to discord between the Turks and their German advisers. Much work was done in every department to bring the scheme of operations to perfection as the appointed day approached.

On the 17th, while visiting the 53rd Division to discuss final details with the A.D.M.S., I received a telephone message from Corps Headquarters that I was to report forthwith to General Headquarters at Ramleh, no explanation being given.

It is not difficult to image the state of mind that I was in by the time I reached Corps Headquarters at Jerusalem. Doubt as to whether I was in for trouble or the reverse, disappointment at not being able to see the fruition of our carefully worked out plans for the morrow, sadness at leaving the staff with which I had served since its formation, and a Chief whom we had all learned to love and honour, brought about a mixture of feelings difficult to describe. When I arrived I found that I was temporarily to take over the duties of Director of Medical Services to the whole Force.

I packed up my immediate necessities and started off post haste to Ramleh, leaving my servant to follow with the remainder of my baggage.

CHAPTER XXVI.—DIRECTOR OF MEDICAL SERVICES.

The next few days passed like a whirlwind. The great advance, so long looked forward to, started before dawn of September 19. All the medical arrangements had been completed by my predecessor before handing over. I was free, therefore, to start picking up the multitudinous threads of my new work.

The medical staff at Army Headquarters consisted of :—

Director of Medical Services.

Colonel Westropp White—Deputy Director for Indian troops.

Lieutenant-Colonel Bagshawe—Assistant Director, Chief Staff Officer.

Lieutenant-Colonel Angus—Deputy Assistant Director, Sanitation.

Major Bird—Deputy Assistant Director, Personnel.

Lieutenant-Colonel Heron—Deputy Assistant Director, Egyptian Hospitals.

Captain Houston—Chief Clerk.

There was also a medical officer in charge of the Headquarters' camp.

Each of the three Army Corps had a D.D.M.S. with whom the D.M.S. dealt directly on medical matters.

For the Line of Communication, which included at this time Jaffa, Ramleh and Jerusalem and extended back as far as the Suez Canal, there was an A.D.M.S.—Lieutenant-Colonel Abraham.

West of the Canal, the Force in Egypt was under a separate Command with Colonel Knaggs as its A.D.M.S. Alexandria was a subordinate Command under the G.O.C. Force in Egypt and had an A.D.M.S.—Colonel Beach.

Belonging to the Egyptian Expeditionary Force and under control of the D.M.S. there were at this time ten British General Hospitals, one Australian and five Indian. The nominal war establishment of a British or Australian General Hospital—as in other theatres of war—was one thousand and forty beds, the odd forty being for officers ; that of an Indian General Hospital was five hundred, but at the time of the advance almost all the hospitals had been largely expanded and several of the British ones were able to take two thousand at a pinch.

The three British General Hospitals at Alexandria were :—

No. 17 in the Victoria College, at Sidi Bishi.

No. 19 in the Deaconess German Hospital.

No. 21 in the barracks at Ras el Tin.

No. 15, which had been the first general hospital sent out early in 1915. and which had occupied the Abbassia secondary schools, had recently been closed down when the British troops were being reduced. The Indian hospitals were also largely above establishment.

There were five British hospitals at Cairo :—

The Citadel already referred to.

No. 27 in the police barracks at Abbassia.

No. 31 in the Main Barracks, Abbassia.

No. 71, formerly the Red Cross Hospital, in the boys' school at Gizeh, and Nazrieh Hospital, later on numbered 88, with the inception of which in the summer of 1915 I had been so largely interested.

The Australian General Hospital, known as No. 14, was located in the extensive new workshops belonging to the Suez Canal Company on the eastern bank of the Canal Docks at Port Said. It was a magnificent site,

open to the harbour on the west and to the Mediterranean on the north. The buildings, which were new, lent themselves well to adaptation as hospital wards.

Of the Indian General Hospitals, one was at Masaid near el Arish, one at Kantara, one at Cairo in the New Barracks at Abbassia, one at Suez, and the fifth, known as No. 5, was divided into three portions, each expanded to the size of a full general hospital. Its headquarters was at Suez and the other sections at Alexandria and Kantara respectively.

Of stationary hospitals there were six British, two Australian and two Indian. Each of these was equipped for four hundred beds. Two British, Nos. 47 and 48, at Gaza; two, Nos. 24 and 44, at Kantara; No. 26 at Ismailia, and No. 36 at Suez. One of the Australian Stationary Hospitals was at Moascar, near Ismailia, the other in Cairo. One Indian Stationary Hospital was at Gaza, the other, No. 137, was at Suez.

The casualty clearing hospitals were of three types—"British" (which retained the name Clearing Station), "Indian" and "Combined." Of the British there were five, Nos. 26 and 76, at Ludd; No. 74 at Limber Hill, twelve miles north of Jerusalem; Nos. 65 and 66 (formerly the 54th Divisional Casualty Clearing Stations) in Jerusalem. The two Indian Clearing Hospitals, Nos. 31 and 24, were both at Ludd. Of the four "Combined," for which a special local establishment had been drawn up so that they could take either British or Indian patients, No. 33 was at Jaffa, No. 15 at Wilhelma, immediately behind the main point of the attack, Nos. 32 and 34 at Jerusalem.

The casualty clearing stations were nominally equipped to take two hundred patients, but several of them had had their establishment brought up to four hundred at this time.

The hospitals and clearing hospitals east of the Canal, including those at Port Said, Ismailia and Suez, were under the administration of the A.D.M.S. Lines of Communication. An exception was made in the case of No. 74 Casualty Clearing Station at Limber Hill which was under the D.D.M.S. 20th Corps as it was so far forward. Those in and around Cairo were directly under the A.D.M.S. of the Force in Egypt. Those at Alexandria under the A.D.M.S., Alexandria.

Extensive arrangements had been made for the medical care of the large body of Egyptians employed either in the Egyptian Labour Corps, in the Camel Transport Corps or as drivers in the Army Service Corps.

In this organization there were three classes of hospitals. Stationary hospitals, detention hospitals, and a small unit called a reception hospital which could be moved about with any party of Labour Corps. All the Egyptian hospitals were under the administration of the A.D.M.S. Egyptian Hospitals, Lieutenant-Colonel Heron. The Egyptian hospitals were largely used during the great advance to augment the Prisoner of War Hospitals, of which there were five situated respectively at Cairo, Kantara, Ludd, Suez and Alexandria. There were besides, special officers'

hospitals at Cairo and Alexandria. The former was in the Sirdarieh, the official residence of the Sirdar of the Egyptian Army, which was lent by Sir Reginald Wingate who at this time held the dual office of High Commissioner and Sirdar of the Egyptian Army. That at Alexandria was in the old military hospital on the point at Ras el Tin which has already been referred to. There was an infectious hospital in the Austrian Civil Hospital in Cairo, a mental hospital—also in Cairo—and a special hospital for the treatment of orthopædic cases at Helouan, ten miles from Cairo, where there was a Zander Institute. There was a hospital for Nursing Sisters at Abbassia and convalescent hospitals in the Boulac Palace at Cairo and in the Khedive's Palace at Montaza, about eight miles from Alexandria, while at Cairo and Alexandria there were large convalescent depôts through which patients were returned to duty.

The total hospital accommodation for British and Indians, apart from field ambulances, was well over twenty thousand.

There was a huge medical store depôt at Alexandria from which stores were sent not only to Egypt and Palestine, but also to Salonica.

A Sanitary Section was attached to each division, and three or four others worked on the lines of communication. The divisional ones were generally with their divisions, but at times they were taken under the direct control of the D.D.M.S. of the Corps and used as he thought best. They were thus sometimes divisional and sometimes corps units.

Nine hospital trains were specially fitted for the conveyance of European patients and two others for the use of Egyptians. Six of these were employed on the east side of the canal. Most of the hospital trains had been constructed in Egypt out of local rolling stock by the Egyptian State Railway, but two or three were sent out complete from England. They were well appointed and very comfortable. Although a swing bridge of boats was constructed across the Suez Canal at Kantara in connexion with the railway to permit the passage of trains, it was never used for through traffic or the conveyance of patients. All patients brought down the line were admitted *en route* to one or other of the hospitals at Kantara and reloaded into hospital trains on the west side of the canal. The hospital trains on the east side of the canal were controlled by the A.D.M.S. Lines of Communication, those in Egypt by the D.A.D.M.S., G.H.Q., 2nd Echelon, stationed at Cairo.

All the hospital ships in the Mediterranean, about twelve in number, including those serving Salonika and the Dardanelles, were nominally under the control of the D.M.S., Egyptian Expeditionary Force, and all those plying between India and Suez. There was, however, at this time so much interference with the movements of the ships by other authorities, working direct through the War Office and Admiralty at Home, that the control, except of those detailed for evacuation of our own patients, had practically passed out of our hands, though we were constantly being called to account if any delays in evacuation occurred from the other

theatres of war. The details of the movements of the ships was another of the duties of the D.A.D.M.S., 2nd Echelon, who worked in close conjunction with the Principal Naval Transport Officer (Pinto) whose office was also in Cairo. The disposal of hospital ships and hospital trains involved constant telephonic communication between my office at G.H.Q. and the D.A.D.M.S. at Cairo.

Generally speaking, telephonic communication was exceedingly good both with Cairo and throughout the whole Force, but in time of stress and in bad weather it was sometimes difficult. Under favourable conditions we could telephone to Alexandria direct from G.H.Q., a distance of well over three hundred miles, but often in times of emergency it was tedious and rather trying to the temper.

The Allied Detachments, French and Italian, made themselves entirely responsible for the medical care of their own people, both as regards the field and base hospital accommodation. We never interfered in any way. All they asked of us was the use of our hospital trains. These detachments were never very large and their medical administration seemed to work quite smoothly. My own personal relations with their medical services was confined to a very cordial friendship with the officers of one of the French field ambulances, which began at Deir el Belah in the summer of 1917 when I was D.D.M.S. of East Force and which was renewed from time to time afterwards—once at Jerusalem and once again shortly after the big advance when I visited their station on the western fringe of the Judæan hills, the Allied Detachments having taken an active part by an attack on that section of the Turkish position.

(To be continued.)

Current Literature.

WELLS, W. F., & WELLS, Mildred W. **Air-borne Infection. Sanitary Control.** *J. Amer. Med. Ass.* 1936, v. 107, 1698-703; 1805-9, 5 figs [27 refs.]

This communication epitomizes much of the remarkable work done on the subject of air-borne infection by the first-mentioned author. The air as a vehicle of infection, although dominant in the minds of early workers, has gradually come to be almost disregarded in this respect by modern public health workers, but W. F. Wells, by the invention of an instrument for the exploration of controlled atmospheres, and the development of a technique for producing bacterial suspensions in these, has brought the whole subject into prominence again. Two forms of transmission of infection through the air are recognized. Droplet infection proper, as described by Flügge, applies to droplets larger than 0.1 millimetre in diameter, but these are rapidly removed from the air by gravity before they

can dry and within a short distance of the source. The second form may be called air-borne infection and consists of the dried residues of infected droplets less than 0.1 millimetre in diameter, depending primarily on air for the buoyancy which keeps them suspended for longer times and carries them for longer distances. The epidemiological characteristics of droplet infection and droplet nuclei infection are by nature opposite, the former being localized and concentrated, while the latter is more dispersed and dilute. The time and distance which infection from droplet nuclei may travel depend more on the viability of the organism in air than the settling rate, and the rate of disappearance of various organisms from the air into which they have been expelled has been estimated. A group of respiratory organisms including pneumococcus, *C. diphtheria*, and streptococci were decidedly more viable than organisms typical of the intestinal tract. The viability of a *Bact. dysenteriae* Hiss Y bacteriophage was greater than for the intestinal group, but less than for the respiratory. Influenza virus could not be recovered after an hour, but it is not believed that the end point of influenza virus has necessarily been reached. The slow rate of settling of nuclei produced by evaporating droplets distinguishes them from particles of bacteria-laden dust, and they therefore drift with much greater readiness. Wide distribution of nuclei throughout a building by ventilating currents was demonstrated by inoculating with *Bact. coli* the humidifying water of an air conditioner in the basement. It was also shown that droplets sufficiently small to evaporate completely are actually expelled into air by expiratory processes, and that such droplets may, during pathological reactions, be infected. Whenever a person sneezes many thousand nasopharyngeal organisms remain suspended in the air, and in commonly occupied enclosed spaces the exchange of nasopharyngeal flora is inevitable. In this connexion the authors wish to resuggest that the alpha streptococcus, normally present in the nasopharynx, be employed as an index of nasopharyngeal contamination of air as *Bact. coli* is now similarly employed as an index of the degree of intestinal contamination of drinking water. The burden of proof that air-borne infection was unimportant has hitherto rested on negative bacteriological findings, but the present researches have shown that such findings are no longer tenable. The widespread occurrence of cases of measles and smallpox requires the hypothesis of air-borne transmission, and the modern recognition of carrier and sub-clinical infections as well as cases of disease has widened the conception of infection so greatly that the indications are that many, if not most, of the nasopharyngeal infections spread as readily and as broadly as the virus of measles. Those who believe that "contact" is necessary for the transmission of infection may suggest that the special conditions which have been set up for the spread of air-borne infection are likewise conducive to intimate contact, but if proximity in time and space constitutes "contact" then the breathing of one another's air in semi-enclosed spaces would constitute a rather extended form of contact infection. It is necessary therefore to

distinguish the different phases of contact, and it would seem that this might become possible by a statistical examination of velocity of spread by the different phases. Recognizing that all forms of contact co-operate in spreading infection, there is good reason to believe that only that phase called air-borne infection can be swift enough to explain the epidemic spread of nasopharyngeal disease in non-immune populations. The more intimate our knowledge of the modes of transmission becomes, the more evident is it that diseases are adapted to transmission by diverse routes, and among these air transmission of infection may not be the least important. It may be significant that those diseases which have so far defied control are those in which the causative agent enters and leaves the nasopharynx, and statistics and conclusions from the reports of the U.S. Public Health Service are cited in support of this. The authors assert that until the purity of our common air supplies can be established through sanitary control, the transmission of these diseases by air cannot be disproved.

In the second instalment of this long paper are described experiments devised to show the effect of physical and chemical agents in reducing the number of micro-organisms suspended in air. Very briefly, the results were that by increasing the relative humidity of the atmosphere a reduction in air-borne *Bact. coli* was brought about. The introduction of ozone and chemical germicides was also of effect, but the bactericidal effect of ultra-violet radiation proved to be of a higher order of magnitude than any of these. The various factors concerned in bringing this about are described and discussed at length, and the authors suggest that the experimental application of sanitary air control on these lines is now indicated in hospitals, schools, and other gathering places.

A. JOE.

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TUBERCLE. 1937, Feb. Supp., 46 pp. **The Results of Artificial Pneumothorax Treatment: Reports to the Joint Tuberculosis Council** by W. BRAND, P. W. EDWARDS, C. O. HAWTHORNE, G. JESSEL, S. Vere PEARSON, D. A. POWELL, D. P. SUTHERLAND, J. WATT, R. R. TRAIL & G. D. STOCKMAN.

This report is the work of a committee appointed by the Joint Tuberculosis Council, the statistics being obtained from forty-two tuberculosis institutions in Great Britain and Northern Ireland. It was decided to limit the investigation to cases in whose sputum tubercle bacilli had been demonstrated. As the material was supplied by many different observers, the cases were divided into only a small number of broad groups. In order to eliminate as far as possible variations in classification due to the personal factor, the following groups were used:—

Group 1.—Cases of unilateral disease without definite evidence of cavity, the other lung being clear

Group 2.—Cases with evident cavity in one lung only, and with or without limited lesions in the opposite lung, not involving more than one-third of the lung.

Group 3.—All other cases, including cases with severe complications, such as advanced laryngeal disease.

Observers were requested to classify their cases into these three groups in accordance with physical signs and radiological appearances. Although this method of grouping overcame as far as possible the natural difficulty of placing borderline cases, there may have been slight discrepancy owing to varying personal standards. The majority of the cases used fall within the years 1927-1932, but in a small number of cases pneumothorax had been instituted fifteen or more years before the date of investigation. The periods of observation therefore range from less than one year up to twenty-two years. After sorting into groups, the cases were divided into (a) those in whom a pneumothorax was successfully induced; (b) those in whom induction was impossible owing to adhesions, etc., or in whom the pneumothorax had to be abandoned within three months of induction. A control group was obtained from the records of the King Edward VII Sanatorium, Midhurst. Unfortunately, this control group did not accurately correspond with those of the records under review. The grouping of the Midhurst controls was as follows :—

Group 1.—Disease of slight severity, limited to small areas of one lobe on either side, which, in the case of affection of both apices, did not extend beyond the spine of the scapula or the clavicle, or in the case of affection of the apex of one lung, did not extend below the second rib in front.

Group 2.—Diseases of slight severity, more extensive than Group 1, but affecting at most the whole of one lobe; or severe disease extending at most to the half of one lobe.

Group 3.—All cases of greater severity than Group 2, and all those with considerable cavities.

It will be seen that the Midhurst Group 1 case is slightly more restricted in regard to extent of disease than the Report Group 1, while the Midhurst Group 2 has considerably more limited disease and is therefore of better prognosis than the Report Group; again, part of the Midhurst Group 3 cases are bound to fall into the Report Group 2.

Apart from obvious advantages which the Midhurst group cases possessed, the report considers that cases selected for artificial pneumothorax treatment were, in general, less favourable in their prognosis than those within the same groups for whom such treatment is not advised. This generalization applied even more in earlier than in recent years, since in the former it was customary to reserve the treatment for the less favourable case. If two cases apparently exactly alike are admitted to sanatorium together, and observed for a period, and if one of them shows a

steady improvement in his lung disease, whilst the other does not, the former is likely to be treated purely on a sanatorium régime, whilst the latter is advised to have pneumothorax treatment. In other words, artificial pneumothorax is set the more difficult task and the two cases really belong to different categories. It is considered, therefore, that this Midhurst control group presented cases of essentially better prognosis, whereas the cases investigated by the committee showed a group of failures which was a severer test of the value of artificial pneumothorax. It must be borne in mind, too, that the Midhurst cases have been followed up for an average period of ten years, whereas those in the report have only been followed for an average period of three, and there can be no valid comparison of results unless the errors caused by these difficulties are calculated by proper statistical methods. When this was done for the committee by Mr. Stockman and a ratio of actual to expected deaths tabulated, it was found that this ratio was substantially higher in the cases which had had artificial pneumothorax without ancillary methods of treatment, than it was in the Midhurst control. It was only where ancillary methods were used to supplement the artificial pneumothorax treatment that approximately equally good results were obtained.

Mr. G. D. Stockman contributes a section of the report, written from a statistical point of view. He is in agreement with the committee that the Midhurst control is not a satisfactory one, but apparently no other comparable series was available. After commenting on some of the limitations of the investigation, such as number of untraced cases, failure to note whether there had been a recent sputum test, adequate particulars as to age groups, etc., he goes on to point out that the figures in Appendix 7 probably afford the most reliable bases on which to make comparisons, because in this appendix results are shown according to the number of complete years for which the cases have been observed, due allowances having been made for the element of age in the ratios of the actual number of deaths to the expected number, according to the English Life Tables No. 9. The figures in Appendix 7 are classified according to the controls (men and women), artificial pneumothorax cases (men and women) grouped according to successes and failures, with and without ancillary methods. These figures, again further sub-divided into Groups 1, 2 and 3, as cited at the beginning of this abstract, are too extensive for reproduction. Mr. Stockman concludes that the results must be regarded as inconclusive, and urges that in future, cases observed should be more strictly comparable, an accurate control group should be aimed at and, if possible, the observations should be consistently made by a single observer. Had the results of the present investigation indicated the superior vitality of cases treated by artificial pneumothorax, having regard to the more favourable circumstances of the cases included in the Midhurst control, its benefits could justly have claimed to be proved; that they have not, does not however disprove the efficacy of the treatment, but indicates the need for further research. For

such research the method adopted in Appendix 7 of comparing actual deaths with those which would have arisen had the mortality followed that derived from a standard table, is probably effective. [This report may be compared with that published for the London County Council cases by Dr. F. J. Bentley, M.R.C., Special Report Series No. 215. H.M. Stationery Office, 1936, reviewed in the *Bulletin of Hygiene*, 1937, v. 12, 84.]

S. ROODHOUSE GLOYNE.

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FLORELIUS, S. De spesielle lungeundersökelsor under vaabenovelsene 1935. [Special Examinations of the Lungs during Army Training in 1935.] *Tidsskr. f. d. Norske Laegeforening.* 1937, v. 57, 313-23.

Conscription being still in force in Norway, thousands of young male adults are examined by the army medical service every year. During 1935, the recruits passed for military service were tested in various ways in the training centres, all being subjected to the Pirquet test, and the positive reactors having to submit to the sedimentation test. Those whose rates of sedimentation of the erythrocytes was above normal had to pass the third test, which consisted of a radiographic examination of the lungs.

The Pirquet tests showed that the unit with the highest proportion of positive reactions came from the extreme north of Norway, whereas the unit with the lowest percentage of positive reactions belonged to Oslo and adjoining rural areas. The lowest percentage of positive reactions in any unit was 18.9 and the highest was 74.2. It was 25.9 in the Guards, whose men are the pick of the Army. A Pirquet comb-out of the Guards in 1924 showed that 57 per cent were positive reactors—a remarkable change in so short a period. In one unit on the West Coast the proportion of rejections on account of tuberculosis was exceptionally high, although the percentage of Pirquet reactors was one of the lowest on record. Pirquet tests conducted at the end of the season's military service showed little change in the percentage of positive reactors.

The most striking outcome of these examinations in 1935 was the enhanced prestige of the sedimentation test as a rapid means of diagnosing pulmonary tuberculosis early. Among 3,392 positive tuberculin reactors were 248 found to have an abnormally high sedimentation-rate. As many as 130 of these men were found on a radiological examination of the chest to present signs justifying their discharge from the army because of tuberculosis. On the other hand, only 34 of the 3,144 Pirquet-positive men whose sedimentation-rate was normal were rejected for military service.

C. LILLINGSTON.

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HANZLIK, P. J., LEHMAN, A. J., & RICHARDSON, A. P. **Sodium Bismuthate Soluble. A New Product for Intramuscular and Oral Administration in the Treatment for Syphilis: a Preliminary Summary Report.** *Amer. J. Syph.* 1937, v. 21, 1-17. [12 refs.]

Bismuth compounds exist as electro-negative complexes in the body; the greater the completeness and stability of this state at the outset the more uniform and dependable are the pharmacologic and antisypilitic actions and conversely. In other words the oxy-compounds of bismuth are less satisfactory than the sodium preparations.

The ideal in bismuth therapy is to find a compound which can be given by the mouth, which will be well tolerated and really useful. Essential criteria are: a soluble stable alkaline electro-negative complex of bismuth not readily precipitated by the acids of the gastric juice; stability in the presence of weak bicarbonate and intestinal juices; no precipitation with proteins; quantitative absorption; fatal dosage in animals; satisfactory margin of safety; therapeutic dosage not to be excessive; satisfactory gastro-intestinal tolerance; no undesirable side effects; definite anti-syphilitic action.

Sodium bismuthate (NaBiO_3) has been in use for many years; it contains 70 to 74 per cent bismuth and is only soluble in 10,000 parts of water. In order to render it soluble use is made of triisopropanolamine and propylene glycol and the solution diluted with water. The preparation for intramuscular injection contains 3 per cent sodium bismuthate, 8 per cent triisopropanolamine and 50 per cent propylene glycol—the remainder being water. The preparation for oral administration is essentially the same, but it contains less propylene glycol and no water. For intramuscular injections 1 cubic centimetre of the solution is used containing 21 milligrammes of bismuth; for oral administration 6.7 cubic centimetres of the solution containing 0.14 gramme of bismuth, in capsules. Given intramuscularly or orally the drug is completely and rapidly absorbed; it can be found in the kidneys, liver, brain and blood and is excreted in the urine and faeces. It has a definite action both on experimental syphilis in animals and on clinical syphilis in man. No undesirable side effects have been noted and the margins of safety for therapeutic administration are ample. It is concluded that "sodium bismuthate soluble" is worthy of an extended and controlled clinical trial.

T. E. OSMOND.

Reprinted from "Bulletin of Hygiene," Vol. 12, No. 6.

FOX, F. W., & WILSON, Cicely. **Lucerne as a Food for Human Consumption.** (Laboratory Report No. 3 of an Inquiry into Native Diets.) Pp. 17 + vii + iii. [24 refs.] The South African Institute for Medical Research, Johannesburg.

Lucerne or alfalfa is grown in some thirty countries as a forage plant of high nutritional value. In the last few years, it has been suggested as

a cheap and nutritious addition to the human diet, and the present report gives a comprehensive account of the nutritional value of lucerne from a human point of view, and the best methods of cultivating it, and of preparing it for human consumption. It is fairly rich in protein, the amount in the young plant being 25 per cent of the dry weight. The biological value of the hay is 60, and that of the young leaves should presumably be higher. Lucerne contains three times as much Ca as does milk and twice as much Fe as spinach. The Ca of plants is thought to be less available than animal Ca, probably due to the presence of oxalic acid. In this connexion, lucerne has been shown to contain very much less oxalic acid than spinach. The plant is a good source of vitamin A, which is present largely in the leaves and is found in greater quantities in young than in old leaves. Lucerne is a moderate source of vitamin B. The amount of D present is much greater when the leaves are dried in the sun than when artificially dried. Fresh lucerne is a rich source of vitamin E. The present authors have studied the antiscorbutic activity of lucerne and show this plant to be an exceptionally rich source of vitamin C, containing about five times as much of this vitamin as the same weight of orange juice. This value falls off after cutting, so the plant should be used as fresh as possible. It retains much of its C content if cooked like spinach, in a very little water. Lucerne meal can be prepared so as to retain a fair amount of vitamin C if the action of enzymes is arrested in the beginning. It is calculated that lucerne could supply a daily protective dose of vitamin C at one-fifth of the price of the same dose from an ordinary vegetable source. Various ways of using lucerne as a food are suggested, the leaves and young shoots being preferable, as the stalks are rather fibrous. The leaves can be used as a salad, cooked like spinach, chopped in stews and omelettes, etc. It would be of special value in native mine boys' diets in South Africa, etc., where cheap and highly nutritious foods are required, as providing protein, Ca, Fe and vitamins.

DOUGLAS C. HARRISON.

Reprinted from "Bulletin of Hygiene," Vol. 12, No. 6.



Reviews.

THE JOURNAL OF THE UNIVERSITY OF MANCHESTER. No. 1, Vol. i.
1937. Manchester: University Press.

This publication, the inaugural number of the *Journal of the University of Manchester*, should be very welcome to graduates interested in the University's welfare and progress and, as Sir Christopher Needham, the Chairman of Council, puts it in the opening article, forge "new and stronger links of affection and generosity between the Alma Mater and her sons and daughters." If this excellent number—which deals with many aspects of the work of the University—reflects the good fare to be served in future numbers, this object will be more than achieved.

Copies of the Journal will be supplied without charge, on application, to graduates and friends of the University.

THE MORPHINE HABIT AND ITS PAINLESS TREATMENT. Second Edition.
By G. Laughton Scott, M.R.C.S., B.A.Oxon. London: H. K. Lewis
and Co., Ltd. 1937. Pp. viii + 106. Price 5s.

In the opening chapter, the author of "The Morphine Habit" considers the cause of addiction in England. He believes that the habit is usually acquired either during some painful illness or more frequently in an attempt to tide over a special stress or overwork. In Chapter III he discusses the difficulties of recognizing the symptoms and signs of addiction as they resemble those of any profound chronic toxæmia. If, however, the patient can be detained and the supply cut off, then diagnosis becomes only too easy from the onset of symptoms following withdrawal, viz. an ashen colour of the face, tremors, spasms, great mental lethargy, diarrhœa and collapse.

Next the pathogeny of the withdrawal state is considered and the author explains this by the action of the morphine as a vagal centre stimulant and depressant of the sympathetic. Abstinence therefore ushers in a series of sympathetic explosions.

In treatment he considers that belladonna and atropine, which have a somewhat similar pharmacological action to morphine, can be employed as substitutes, gradually increasing the atropine or belladonna as the morphine is reduced. In this way minute increasing doses of atropine can be added to the patient's usual injections, thus gradually diminishing the morphine, but keeping the pulse slow all the time by the addition of the substitute drug.

Chapter X deals with convalescence. Here he believes quiet and rest to be most important during the fatigue period which follows the recovery from addiction. A condition of great exhaustion is the most potent cause of early relapse.

Energy, he considers, should be conserved well throughout convalescence to allay the onset of late cravings.

This small volume should be consulted by those who have to deal with such addicts.

A. G. B.

THE LIFE AND CONVICTIONS OF WILLIAM SYDNEY THAYER, PHYSICIAN.

By Edith Gettings Reid. London: Oxford University Press. 1936.

Pp. xii + 243. Price 10s. 6d.

"The Life and Convictions of William Sydney Thayer" is a biography of considerable interest. Commencing with a brief description of his parents and early life as a student, it goes on to relate his association as assistant with Osler during the period when that great man was chief physician at the Johns Hopkins Hospital. The author writes, "Of all Osler's associates, Thayer came closest in contact with him in the work of the hospital, first as assistant resident physician, then as resident physician and head of the medical department of the dispensary. Step by step he followed every phase of Osler's work."

During the Great War Thayer proceeded to Russia with a Red Cross Mission. The book tells of the terrible conditions that existed during the Revolution, with all its horrors. Later in the War he proceeded to France before being recalled to the post of Professor of Medicine at his old school.

A. G. B.

DIAGNOSIS AND NON-OPERATIVE TREATMENT OF THE DISEASES OF THE

COLON AND RECTUM. By Gottwald Schwarz, M.D., Jacques Goldberger, M.D., and Charles Crocker, M.D. London: H. K. Lewis and Co., Ltd. Pp. xii + 540. 246 illustrations and 9 coloured plates. Demy 8vo. Price 40s. net.

The distinguished authors of this book have succeeded in the task they set themselves. After chapters on anatomy, physiology, physical examination and laboratory methods, they go on to give a full discussion on proctosigmoidoscopic and X-ray examinations. To the discussion on X-ray diagnosis no less than 135 pages are given, and these are freely illustrated.

The various diseases are then considered in more detail, short descriptions being given before their diagnosis and non-operative treatment are discussed.

Among the diseases considered are diarrhoea, food infection, the dysenteries, sprue and parasitic disease of the intestine. The sections on treatment are clear and give the details of the dietetic régimes advised.

This book can be confidently recommended to the Royal Army Medical Corps Officer; it contains much of use to him in the treatment of those conditions which he encounters so frequently during his service abroad.

D. C. B.

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The Editor will be glad to receive original communications upon professional subjects travel, and personal experiences, etc.

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Journal of the Royal Army Medical Corps.

Original Communications.

THE PRINCIPLES OF ADEQUATE ARTIFICIAL ILLUMINATION.

BY MAJOR J. BIGGAM, M.C.,
Royal Army Medical Corps.

(Continued from page 83).

ILLUMINATION AND ITS RELATION TO VISION.

The Effect of Illumination on Visual Acuity.

Broadly speaking, visual acuity increases steadily, proportional to increasing illumination, up to standards of brightness far beyond those in ordinary use.

Under research conditions it was found that up to a brightness of about 12 foot-candles visual acuity is directly proportional to the logarithm of the illumination. Acuity still continues to improve up to, and beyond, 1,000 equivalent foot-candles, provided that the surrounds are adequately illuminated at the same time.

The effect of the brightness of surrounds in increasing visual acuity is important in practical design. Apart from its effect on actual acuity, undue contrast between the illumination on the work and that on the surroundings produces an unpleasant feeling of strain.

It is uncertain at what point visual acuity came to a maximum but as, for example, the lace workers in Geneva work in brilliant sunshine, so that the white material must have a brightness of many thousands of equivalent

foot-candles, the reason for this choice would indicate an improved acuity even up to that illumination.

Industrial research has shown that output in certain fine work does not reach its maximum daylight value until an artificial illumination of the order of 20 foot-candles is attained, this illumination being provided by a well-planned installation designed to secure approximate uniformity over the whole area of work.

In the case referred to (typesetting by hand) an increase of average lighting from 1·30 to 20·0 foot-candles increased production by 24 per cent.

In wool knitting an increase from 5·0 to 50·0 foot-candles caused an increased production of 20 per cent., and in silk weaving raising the illumination from 50 to 100 foot-candles increased production by 21 per cent.

In these days of increasing Army mechanization illumination in many spheres of work will have to approximate to accepted modern standards of industrial lighting, and the same factors will have to be considered: Effect on output; effect on quality of work; effect on accident incidence, i.e. the proper lighting of dangerous machinery as a safety factor.

Defective lighting tends to affect detrimentally both the quality and quantity of the work turned out. The factors mentioned apply, of course, to-day to technical shops at present in being in barracks.

The reason why industrial lighting values have arisen so rapidly in recent years is that the employer finds it commercially economical to: (a) Increase output by better lighting, rather than by an increased wage bill, (b) pay for more light rather than pay a higher accident compensation rate.

Daylight Illumination.

Normal daylight enables our eyes to function under the best possible conditions.

Its characteristics are also those which must be aimed at in the production of a good system of artificial lighting, except that its spectral composition does not appear to be necessary unless for special purposes.

It is adequate even when greatly obstructed, and adequacy is the first condition which any lighting installation should satisfy, to ensure that objects can be seen easily and quickly by persons of average visual capacity. It has an excellent distribution ensuring the avoidance of undue contrast, has good uniformity and even diffusion with the avoidance of shadow (apart from direct sunlight).

No artificial lighting system can replace ideal daylight conditions, but daylight illuminations (in addition to their colour and diffusion advantages) are of very high values. Direct summer sunlight on the south coast on a cloudless June day is in the order of 10,000 foot-candles, shaded sunlight 1,000, and indoor lighting near a window on a bright day 200 foot-candles.

Over the greater part of winter, late autumn and early spring, and on wet days in summer the sky brightness is such as to produce an illumina-

tion of about 500 foot-candles on a horizontal surface in the open. Such conditions are probably the worst which may still be regarded as providing reasonable daylight.

"Daylight" Electric Lamps.

Where artificial light is used to mix with daylight and so increase the total available illumination, especially for clerical or similar work, a more satisfactory mixture results from the use of "daylight blue" lamps in suitable fittings than is the case with ordinary pearl or opal gas-filled lamps.

Considerable experimental work has shown, however, that the evidence on this point, except in certain specific cases, is somewhat inconclusive, and it is probable that the nature of the lighting fitting and its distribution factor are much more important in the opinion of the average user than the colour of the light.

A very close imitation of the spectral composition of daylight does not appear to be necessary except for special work.

The ordinary commercial "daylight blue" bulb gives partial correction only, the minimum amount of red and yellow being cut out to produce a daylight effect.

Some workers dislike a high intensity of "daylight blue" illumination, owing to what is usually termed its "cold" effect.

From the point of view of efficiency a definite disadvantage to its use is that, owing to the absorption of the blue glass bulb, at least double the wattage of daylight lamps must be installed, according to the amount of colour correction given by the lamps.

Colour matching units which require that the artificial light used when making the match has, as far as possible, the same spectral distribution as daylight (assuming that a colour match by daylight is the end in view), are specialized forms of "daylight" illumination and will not be described here.

Psychological Adequacy.

During daylight hours we are accustomed to fairly bright surroundings, and these influence our general outlook and sense of well-being.

The psychological effect of inadequate or unsuitable artificial lighting is not confined to the conscious irritation arising from difficulty in seeing. A code of lighting standards based solely on the amount of light sufficient to secure the requisite degree of visual capacity for the work in hand may be physiologically adequate yet psychologically inadequate. Even for rough work the level of illumination necessary to promote a high standard of personal efficiency may be considerably higher than the minimum that would suffice for the visual performance required. It is probable that an average level of illumination of three to four-foot candles is the lowest that is really consistent with true welfare.

Inadequate illumination produces unnecessary fatigue and headaches

from eye strain, induced by overaction of the muscles of accommodation and convergence.

Apart from its effect on the eyes themselves, fatigue has the general effect of depressing the level of efficiency at which all the functions of the body and mind operate, and visual perception is a process which demands attention and apprehension as well as actual capacity to see. Yet it is just when we are most likely to be fatigued, towards the end of the day, that artificial light has to be used. The method of providing it should therefore be such as to stimulate rather than to depress our functional efficiency.

Psychological Effect of Poor Lighting.

The subjective aspect of inadequate or unsuitable lighting is far from negligible.

There can be no doubt that bad lighting conditions have a most depressing effect on those forced to live under them.

The psychological effect of adequate lighting has been amply exploited in civil life.

Few conditions have a mentally more irritating effect than those associated with bad lighting, whether the badness is due to inadequacy or to glare and shadow; and a worker continuously subjected to such conditions cannot be expected to work at his maximum efficiency. Indeed, if other conditions are also adverse, the nerve strain involved may be enough to precipitate a complete breakdown in health.

Good lighting is an aid to good discipline and decorum.

Suitability of Illumination.

It is probable that sufficient attention is not paid to the requisites of good lighting other than mere adequacy; for example, shading and the relative position of light sources and work. The light fittings in a room may be efficient as regards throwing light down on the plane of work, yet if the ceiling is left in too dense a shadow, the whole interior appears oppressive.

To take a concrete illustrative case, if we accept the requisites of good lighting as: (1) Adequacy. (2) Suitability—(a) Uniformity and constancy; (b) prevention of glare; (c) avoidance of shadow; and apply them to a "tailor's shop" in barracks, we might, if the lighting conditions were poor, find the following conditions:—

In a small room several separate unshaded pearl bulbs are pulled down to the level of each man's forehead directly over his work. These bulbs may be of a higher wattage than that authorized.

In such a case the conditions as regards illumination would be: (1) Local adequacy on the point of work—general inadequacy in the room as a whole. (2) Suitability—unsuitable for the following reasons: (a) Lack of uniformity; (b) marked prevalence of direct glare; (c) sharp and dense shadows except directly on the local area of work. (A certain degree of

“shadow” is not undesirable in tailoring, as it aids perception of detail, but it should be soft and luminous shadow.)

Tailors working under the conditions mentioned would probably complain of eyestrain and headaches due to unsuitable lighting, and such complaints would be well founded.

The office workers in the Army, often on duty for long hours and sometimes working on documents pencilled on coloured paper, require, in my opinion, particularly carefully designed and adequate illumination.

Glare.

Glare may be one of two varieties: (1) Direct glare; (2) reflected glare (indirect glare).

Direct glare may be defined as the entry of light into the eye from sources other than the object looked at.

Reflected glare as the entry into the eye of too much concentrated light.

Both may be encountered simultaneously. For example, in driving a car towards the low evening sun, one is dazzled by the direct glare of the sun and at the same time by a specular (mirror) reflected glare from the polished road surface.

The effects of glare are probably due to the scattering of light within the eye.

It is common knowledge that gross glare gravely affects visual acuity, but with some of the smaller sources of high brightness, so sited as to act as glare sources, the effects are purely subjective and produce no measurable depreciation of performance.

Nevertheless, although a glare source may produce no lowering of visual acuity, the subject affected may shade his eyes with his hands, or take other steps to avoid it. He has the feeling that the conditions are unfavourable.

Even if a worker may never look directly at such light sources, yet he is troubled by their presence near to the object at which he is looking.

In workshops the temporarily dazzling effects of glare, and the consequent impairment of vision, makes for inefficiency of work and renders the worker more liable to accident, apart from the subjective irritation of the adverse lighting conditions and the eyestrain involved.

Reflected glare is probably mostly experienced by office staffs, in schools and by technical workers. For example light coloured cloth, shining metal or paper, may reflect light directly into the eyes of the worker. Such trying conditions can be avoided by proper positioning of the sources, and by suitable diffusion of, or increase in, the number of lights.

Particular care is required to avoid reflected glare in schools, and this should include avoidance of specular reflections from the blackboard.

As has been noted, illumination on a surface varies inversely as the square of its distance from the source of light.

If, in an endeavour to increase the local intensity of illumination, the light sources are fixed at low levels, the result is uneven light distribution; it may be to an excessive degree (local pools of light in areas of relative darkness) and direct glare from the lamps, if unshaded.

An open conical reflector having no angle of "cut-off" is, naturally, valueless as a shade. Some shallow conical reflectors were originally designed for small electric lamps. The modern large bulb extends far beyond the "shade," and produces dazzle when hung in the line of sight.

The following remarks regarding the angles of "cut-off" of shades are extracted from the "Second Report on Lighting in Factories and Workshops."

"Every light source (except one of low brightness) within a distance of 100 feet from any person employed should be so shaded that no part of the filament, mantle or flame is distinguishable through the shade, unless it be so placed that the angle between the line from the eye to an unshaded part of a source and a horizontal plane is not less than 20° , or in the case of any person employed at a distance of six feet or less from the source, not less than 30° ."

With regard to the above it may be mentioned that practically every Army light source is a source of high brightness. Methods of producing sources of low surface brightness, such as diffusing globes, are used only in very exceptional circumstances.

By "low brightness" is meant an intrinsic brilliance of not more than five candles per square inch.

It should be remembered that the covering of a brilliant source by a very small shade, e.g. a small opal globe surrounding a high-power electric source, may give this globe a brightness three or four times as great as five candles per square inch, so that it may cause considerable glare, and should consequently be treated as a source of light in itself.

An ill-positioned office light, which is adjustable as to height, can be pulled down and fastened above an individual table by means of an arrangement of strings. By the same device it can afterwards be moved to various parts of the same office, and so used locally as work requires.

Such an arrangement violates all canons of good lighting.

In hospital lighting it is particularly important to avoid direct glare.

If wards, particularly small wards and bunks, are lit by centrally positioned sources of high surface brightness, it may be found that the natural line of sight of bed patients is almost directly at the light, producing an effect of intense direct glare.

Such glare conditions are very trying, especially to seriously ill or dangerously ill patients, who are unable to alter their position in bed so as to avoid the light. Centrally placed hospital ward lighting should be carefully positioned, of relatively low intensity, and of very low surface brightness, and this lighting should be combined with screened individual bedside illumination.

Remedy for Glare Conditions.

This is a matter of illumination design. Glare can be minimized by such methods as : (1) Adequate diffusion of sources of high surface brightness. (2) Proper positioning of light sources. (3) Increasing the height of sources (their power, or number, or both being increased at the same time, so that the illumination on the plane of work is not diminished). (4) Efficient shading of lights. (5) The use of adjustable screened sources and adjustable concentrators for work at low angles, e.g. medical examination work.

In workshops, and similar situations, a system of low-voltage screened local lighting (run through transformers) is often economical and suitable, and is free from direct glare.

Direct, Semi-indirect and Indirect Lighting.

In *direct lighting* the whole plane is illuminated directly by the lamp (appropriately screened or shaded). This type of lighting involves considerable shadow effects, and unless the installation is well designed the illumination on the working plane may be far from uniform. Unless well designed, too, glare effects are liable to be produced.

In *semi-indirect lighting* the light reaches the working plane partly through a diffusing bowl or similar fitting placed immediately below the lamp completely shielding the direct light from the eye, and partly by diffuse reflections from the ceiling and upper parts of the walls, which receive the direct light of the lamp and which provide a considerable fraction of the whole illumination.

In *indirect lighting* the whole of the light before reaching the working plane is thrown on to the ceiling and the upper parts of the walls, partly by the source directly, and partly from an opaque reflector placed beneath the source. This type of lighting is characterized by the almost complete absence of shadows and the uniformity of the illumination over the working plane, but the brightness of the ceiling and upper parts of the walls must of necessity be high.

The principal distinction therefore between these systems is that in the direct system the light emanates from *points*, and in the indirect from *surfaces*, whilst the semi-indirect system is in some sense a combination of both. In indirect lighting the illumination is more even and diffused, and resembles daylight when the sun is hidden in casting little or no shadow itself, and in neutralizing shadows cast by any other sources that may be in use.

In some cases, however, shadows are desirable ; for example, in the perception of detail in certain classes of material where vision is aided by the contrast produced by miniature shadows on the surface, e.g. sewing on certain materials. In these cases direct lighting is more suitable than indirect.

The necessity for a high reflection factor of ceiling and walls, and the

comparatively low efficiency of indirect systems of lighting will probably militate against their use to any great extent in large-scale illumination systems, such as exist in the Army, where efficiency in relation to cost must be considered.

Under conditions which admit of the installation of an indirect or semi-indirect system of lighting, it will be found to give a particularly pleasant and restful general illumination which can be augmented locally as required by properly shaded movable sources of direct lighting.

Lighting of Army Schools.

School lighting provides a problem of its own.

The illumination may be either inadequate in intensity or ill-distributed in design.

It is necessary, in designing school lighting, that the following main points should be kept in mind :—

(1) *Illumination on the plane of the work* should be adequate and this should include a reasonable degree of uniformity.

(2) *Avoidance of objectionable shadows.* The number and position of lights should be so chosen that objectionable shadows cast by the body, or by structural features of the room on the plane of the work, are avoided.

(3) *Avoidance of glare*, especially the direct glare of unscreened or inefficiently screened lamps, and also of reflected glare.

Numbers (2) and (3) above are a matter of illumination design and lay out.

As regards (1), an acceptable working basis of artificial lighting of schools is that contained in the Report of the Sub-committee appointed by the Technical Committee of the Illuminating Engineering Society published in *The Illuminating Engineer* in July, 1931.

The composition of this Sub-committee is given in the report which is headed "The Artificial Lighting of Schools." Its main points as regards *intensity* of illumination are extracted here :—

(1) The recommended values are minima.

(2) If the illumination is not comparatively uniform the minimum will have to be exceeded in certain parts of the room.

(3) A high depreciation factor must be allowed for in planning an initial installation.

Précis of Recommended Minimal Intensities of Illumination for Schools.

Minimum on the plane of work—five foot-candles for ordinary reading and writing.

For special work (art classes, drawing, etc.) eight foot-candles. (This work is comparable to map reading in the Army.)

Blackboards to have 60 per cent in excess of above lighting, measured on the plane of the board.

No part of any school building to have an illumination of less than one

foot-candle. This to be measured, in the case of stairways, on the tread surface of the stairs.

Great importance is attached to the avoidance of direct and reflected glare, and of objectionable shadows, and details are given in the report regarding the positioning of light sources with a view to the elimination of such defects.

Lighting of Reading and Recreation Rooms.

It might be of interest to outline the principles of modern good lighting of a typical reading room in barracks.

The main requirements for adequate and suitable lighting are, as always :—

- (1) Sufficient illumination for the purpose in view—i.e. adequate intensity measured in foot-candles.
- (2) A reasonable degree of uniformity of illumination.
- (3) Avoidance of troublesome dazzle or glare arising either directly from inconveniently bright light sources (direct glare) or indirectly in the reflection of light in glazed or polished surfaces (reflected glare).
- (4) Avoidance of troublesome shadows cast on books or papers (especially head shadows).

The modern lighting system must be planned to produce specific results, not only in illumination values, but in complete suitability for the purpose in view. The correct spacing of fittings, the different characteristics of fittings, and the reflection factors of ceilings and walls, etc., are all factors of importance that materially affect the final result, and so have to be considered when designing a lighting scheme.

Dark colours for walls and ceilings which absorb much light should be avoided. (The reflection factor of white paint is about 84 per cent, of light buff paint 61 per cent, of deep buff 31 per cent, of light green 47 per cent, and of dark brown 12 per cent.)

Diffused reflection from light surfaces furnishes a valuable addition to the available illumination on shelves and tables, and even more important is the resultant softening of the shadows and the diminution in the contrast between the brightness of light sources and their surroundings.

Unfortunately the lighter the wall surface the more easily it shows dust and dirt.

Polished and glossy surfaces in which images of light sources are liable to be formed should be avoided. Walls and ceilings should have a matt finish. Furniture and woodwork, especially table-tops, should be unpolished.

Adequate general lighting is required, a minimum service illumination at table height being five foot-candles.

Care is necessary to avoid troublesome shadows being cast on books or periodicals by the heads and shoulders of readers. The spacing of lighting units and their height require consideration from this point of view, as also the use of diffusing glassware.

No unshaded lamp should be visible at any angle to persons reading at tables, but when lighting units are visible at an angle of less than 30° from a horizontal line of sight the average brightness of the envelope used to surround the lamp should not exceed five candles per square inch.

It should not be possible for any reader normally to occupy such a position that the illumination on the back of his work or paper exceeds that on the reading surface.

If feasible, instead of general diffuse lighting as above, supplementary local lighting by reading lamps may be employed. In this case the minimum value of the general illumination measured at table height throughout the room should not be less than 1 foot-candle additional to illumination furnished by reading lamps. The combination of general and supplementary local lighting on the tables should not be less than 5 foot-candles.

If reading lamps are used the bulb, which should be of the diffusing type, should not protrude below the level of the lower rim, and their shades, if not opaque, should be of a surface brightness not exceeding one candle per square inch.

Reading lamps should be so designed as to give a wide field of adequate light intensity without glare. Such lamps are available.

The position of bookshelves should be such that objectionable shadows are not cast on the backs of the books with the reader in any normal position.

The minimum illumination on the backs of the books should be 2 foot-candles.

The values of illumination mentioned above are minimum *service* values. A suitable depreciation factor varying from 25 to 35 per cent according to circumstances may therefore be applied.

The above notes, although written from the point of view of outlining the principles of good lighting of reading and recreation rooms, apply equally to many other places, for example the larger general offices.

Ophthalmological Aspects.

The irritation and ill-effects of inadequacy, unsuitability, lack of uniformity, glare and shadow play their part in the production of eye-strain and headaches which, especially in the case of the office worker, are so often attributed to insufficient light. Such complaints are often well founded. They are certainly very frequent.

It has been said that no specific cases of eye disease have been traced as being due to bad lighting.

I am not convinced that this statement is correct.

Perception of detail in vision depends on the size of the image cast on the retina of the eye. For this reason it is important that the illumination provided should be sufficient to make all necessary detail not merely

visible, but *easily* visible; otherwise the only resource available is to increase the size of the retinal image by keeping the eye close to the object, with the result that continuous strain is imposed to a greater or less extent on the muscles of accommodation and convergence, and when the object is fixed, an unnatural position has sometimes to be assumed. Headache is often due to these causes. Myopia may be so caused.

It is by this means of increasing the size of the retinal image that the young man with a full range of accommodation is enabled to do fine work (such as map reading) under indifferent conditions of lighting. He is able to sustain the effort for the short periods required. Complaints of eye-strain from young soldiers attending school are, however, common.

The conditions are very different in the case of the "permanent" office worker. He has to sustain such effort for years, working often long hours each day.

I have for many years noted that a certain number of cases of myopia occur in soldiers whose vision was a normal $\frac{20}{20}$ on enlistment and who some years afterwards were found to be myopic, probably to the extent of reducing their distant acuity to $\frac{20}{80}$ or $\frac{20}{60}$. Such cases almost always seem to occur in young men employed in clerical duties, usually in otherwise healthy looking subjects.

Myopia beginning and advancing in adult life is otherwise not common.

I have been, and still am, uncertain whether their disease is due to prolonged strain under difficult visual conditions.

The idea is certainly very suggestive.

The possible relationship of myopia in childhood to the effects of doing school home work under indifferent lighting conditions must also be borne in mind.

IMPORTANCE OF DESIGN IN IMPROVING INADEQUATE AND UNSUITABLE ILLUMINATION.

It is impossible to over-emphasize what is considered to be the most essential point to be borne in mind with regard to improving lighting installations which have proved to be unsuitable, namely that improved illumination must be the result of improved design and not a mere increase in intensity of existing sources.

In some cases indeed, such a procedure might make conditions even more trying to the worker than they had previously been.

It may be found necessary in certain cases, as an emergency measure, to increase intensity of illumination by increasing the wattage of existing sources, even at the expense of intensifying unsuitability (lack of uniformity, prevalence of glare and of shadows).

Really satisfactory lighting, however, is essentially a matter for collaboration between illuminating engineers and architects with due regard to the conflicting interests of suitability and cost. Such problems have to be

dealt with on a wide basis, and with a consideration of all the factors involved.

When complaints are made that an electric light installation is of too high a power and "trying to the eyes," investigation will almost always reveal that the fault lies in bad design and unsuitability of lighting, and not to excessive intensity.

SUMMARY.

The principles of adequate and suitable artificial illumination are described and discussed including :—

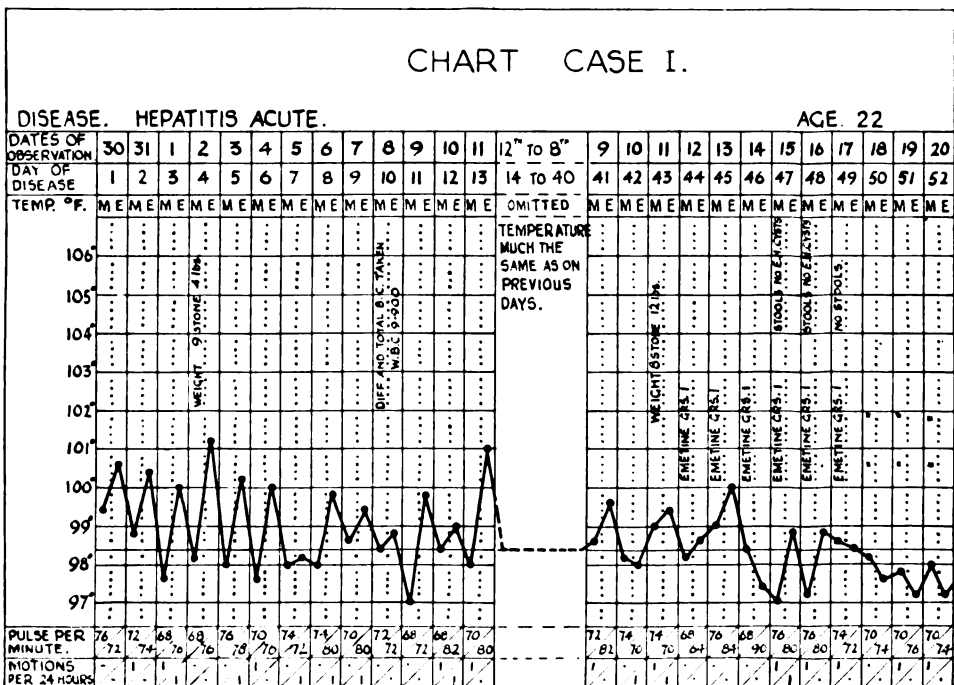
- (1) Apparatus for and methods of measuring illumination.
 - (2) Standards of illumination for various tasks.
 - (3) The effects of illumination on visual acuity and its relation to certain forms of Army work.
 - (4) The psychological effects of inadequacy or unsuitability of illumination.
 - (5) The effects of and prevention of glare, direct and indirect.
 - (6) The lighting of Army Schools.
 - (7) " Daylight " lamps.
 - (8) The lighting of reading and recreation rooms.
 - (9) Medical and ophthalmological aspects of inadequate illumination.
 - (10) The importance of good design as a factor in adequate and suitable lighting.
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DIFFICULTIES IN THE DIAGNOSIS OF SUBACUTE AMOEBIASIS AND THE VALUE OF EMETINE AS A DIAGNOSTIC AGENT.

BY MAJOR J. HUSTON,
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"TRY him on a little emetine!" This sage advice was often given by our elders with regard to obscure fevers and other mysterious disease phenomena which had resisted many forms of treatment. It was good advice. My impression is that it is now less frequently acted upon than formerly. Perhaps we are too engrossed with the types and strains of the great bacillary group of dysenteries to dwell long upon the activities of that simple creature, the *Entamæba histolytica*.

The subacute and chronic forms of amoebiasis are known to be difficult to recognize. Among other obstacles, the following, either singly or in combination, are found: (a) The previous medical history is often negative or misleading. (b) An insidious onset of symptoms and signs. (c) Unusual manifestations. (d) Amoebiasis may occur in the course of another disease. (e) Negative laboratory findings.

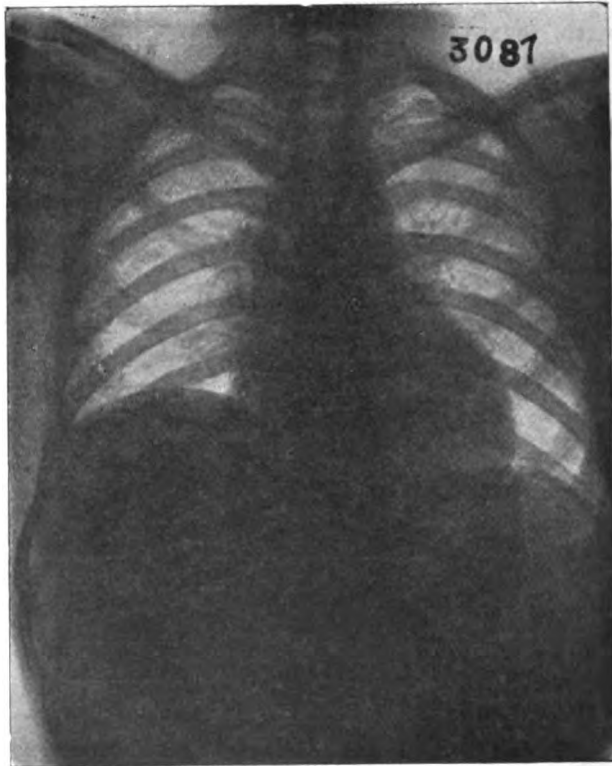


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Among cases encountered within the past two years in the United Provinces, India, the following are reported to illustrate these points :—

Case I.—Previous history misleading and negative.

A private, aged 22, seen on December 11, 1936. History : Two months previously received a severe kick in the right loin while playing rugger. There was acute pain at the time but he was able to finish the game. There had been no obvious hæmaturia. From the date of injury he suffered from malaise, pain in the injured side and constipation, but managed to carry out



Case I.—Radiogram showing elevation of the right side of diaphragm.

his duties which were technical. He reported sick on November 7, 1936, and was admitted to hospital. He had an intermittent temperature, maximum 102° F., for the next four weeks. There were slight night sweats and fairly constant pain in the right lumbar region. Maximum leucocyte count was 10,000 with 65 per cent polymorphs. Arneth count—no change. Red cells: 4,500,000. His medical attendants considered a right perinephritic hæmatoma or abscess was probable.

Palpation of the right kidney area disclosed nothing, but in the right hypochondrium a three fingers' breadth downward enlargement of the

liver was found. A radiogram showed raising of the right cupola of the diaphragm. There was no history of dysentery or bowel disturbance.

Subacute hepatitis was diagnosed and an injection of one grain of emetine hydrochloride given daily for twelve days. The symptoms abated and the temperature reached normal and remained so after five injections. Seven consecutive examinations of the stools failed to reveal *E. histolytica* cysts.

Comment.—In this case a common mistake occurred in associating the illness with the apparently related history of injury. We all make similar slips and it is in such cases that another opinion is of value in reassessing the whole case.

Case II.—Insidious onset in the course of another disease.

An officer, aged 49, was seen on November 2, 1935, complaining of pain in the right iliac fossa of four days' duration. He stated he had had a similar illness six months previously. The abdomen was soft, but there was definite deep tenderness near McBurney's point, and Rovsing's sign was positive. There had been no vomiting and the bowels were constipated. He had some gastric flatulence, but had suffered from it for some years. The pulse and temperature were normal. The leucocyte count was 10,000; polymorphs 68 per cent.

Subacute appendicitis was diagnosed. His condition gave rise to no anxiety, but as he was going on leave soon, operation was advised. On November 28 a small friable subacutely inflamed appendix, adherent to the right leaf of the mesentery, was removed without difficulty through a gridiron incision and the abdomen closed. Apart from one bout of post-anæsthetic vomiting, the next forty-eight hours passed normally. On the third day the evening temperature was 100° F. and the pulse 80; there was a little fulness in the abdomen, although he was passing flatus. On the fourth day the temperature was 101° F., pulse 84; the bowels were well opened with an enema; examination of abdomen and rectum was negative. On the fifth day after operation the maximum temperature was 101·8° F.; the patient was haggard looking and restless, the abdomen was a little distended and the bowels were acting. On the morning of the sixth day the temperature was 101° F. Rectal and abdominal examinations were again negative, except for a slight fulness, with discomfort in the epigastrium. The evening temperature was 102° F. Total leucocytes—10,000; polymorphs 68 per cent, lymphocytes 26 per cent, large mononuclears 2 per cent, eosinophils 4 per cent.

His condition remained much the same for the next three days, and the temperature about the same level. Blood films taken daily were negative for malaria parasites. Blood culture, Widal tests, urine and fæces examination gave no information. By the ninth day it was noticed that the fulness, previously noted in the epigastric area, was a shade more definite.

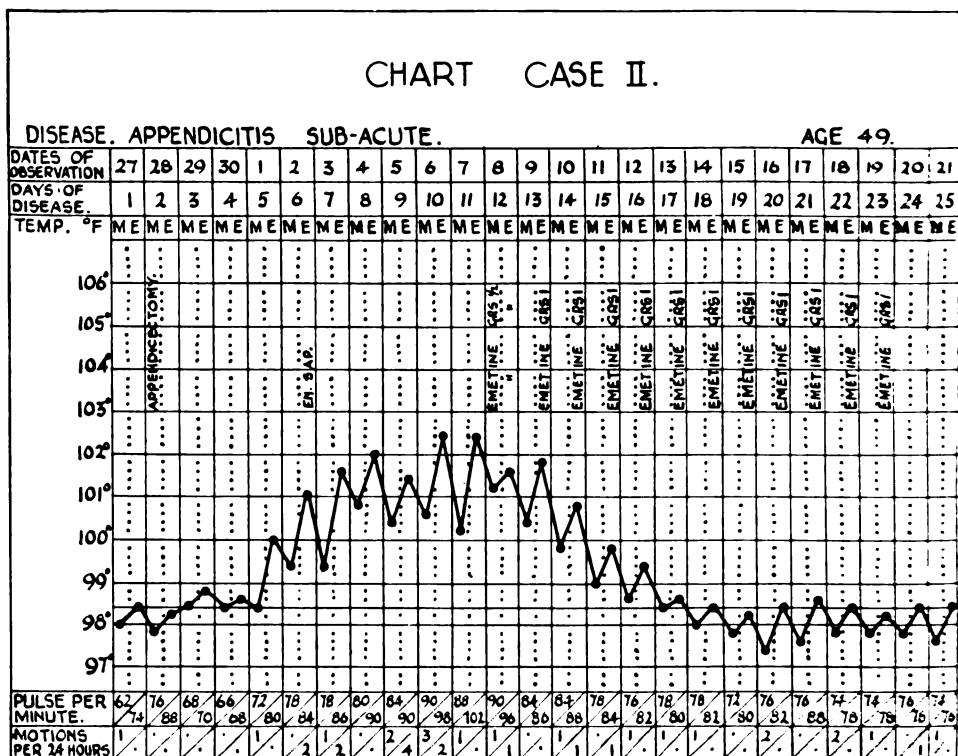
Emetine injections were tried. The temperature came to the normal

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level in six days of gradual lysis. The patient felt a little better each day and his feeling of fulness in the epigastrium disappeared.

No dysentery organisms were isolated in seven specimens of fæces.

The patient reported by letter, fourteen months after the illness, that he had had no further trouble and felt fitter than he had done for years.



Case III.—Unusual manifestation in the course of another disease.

An officer's wife, aged 26, was referred to me as a case of recurrent appendicitis. She gave a history of dyspepsia of several years duration and of attacks of colicky pain in the abdomen with tenderness in the right iliac fossa during the past eight months. On examining her the abdomen was found to be soft but there was definite deep tenderness near McBurney's point. Bimanual examination disclosed nothing abnormal. A barium meal showed no abnormality in the stomach or duodenum; there was, however, a positive gastro-ileal reflex and beaded residue in the appendix for forty-eight hours.

On February 25, 1935, a large swollen fleshy appendix, which adhered by a band to the posterior wall of the cæcum, was removed without difficulty through a right paramedian incision. There followed four days of ordinary convalescence with a normal temperature and pulse. The

bowels were opened once with an enema on the third evening as a small dose of cascara had been ineffective. On the fourth evening a further dose of cascara with liquid paraffin was given. On the following afternoon I received an urgent message to see the patient. While on the bedpan, a large bowel hæmorrhage had occurred. I was shown two bedpans full of recently clotted blood mixed with a few tarry scybala. A blanched patient lay on a bed swamped with blood. The pulse was 130, fluttering and barely perceptible. Suitable treatment was instituted and a blood donor was crossmatched and stood by. There remained the diagnosis of the exact cause of this unfortunate state of affairs.

The abdomen was soft. There was no pain and no vomiting. Digital examination of the rectum was negative. A purpura of Henoch's type or a mesenteric occlusion seemed unlikely on account of the absence of pain and the softness of the abdomen. Hæmorrhage from a peptic ulcer or from a neoplasm (e.g. adenoma or polypus) appeared more probable. The case was discussed with the Specialist in Medicine, Major J. Bennet, R.A.M.C., whose advice is gratefully acknowledged. He informed me that he had seen a similar case, though unrelated to recent operation, and suggested a bleeding amoebic ulcer as the cause.

A course of emetine injections was commenced the same evening. No further melæna occurred and her recovery was uneventful.

On the day following the hæmorrhage the blood showed :—

Red blood cells 3,000,000 per cubic millimetre. Hæmoglobin 40 per cent. Blood platelets 95,000 per cubic millimetre. Leucocytes 15,400 per cubic millimetre.

Sigmoidoscopy at the end of twelve days' treatment showed a normal distal colon.

Pathologist's report on the vermiform appendix was: "Acute catarrh is present, the mucosa being eroded, congested, and infiltrated with leucocytes. The muscular coat is unaffected."

On further interrogation of the patient, she stated that she had blood and mucus in the stools when on her way to India two years previously. On one occasion then, she passed a quantity of blood but it was in no way comparable to the present attack. At the time she had been given stovarsol.

This patient was given a course of eighteen one grain emetine injections, with a fourteen day interval at the end of ten. She reported in January, 1937, that she had had no further trouble with the bowels. Her dyspepsia cleared up three months after operation. That she feels very fit and had had a baby since the illness reported.

Comment.—Intestinal hæmorrhage is mentioned as a complication of amoebic dysentery in the textbooks, but on perusing the subject in four of the most popular of them, one finds that "severe intestinal hæmorrhage sometimes occurs, and unless quickly controlled may be serious" (Byam and Archibald, 1922), is the most illuminating remark in any of them.

DISCUSSION.

One is well aware that the diagnosis of a primary appendicitis in the two foregoing cases (II and III) is open to criticism.

In Case II it is unfortunate that the appendix was not submitted to a pathologist for section and report. Macroscopically, the appendix presented one of the most usual appearances seen in patients who have been victims of repeated mild attacks of catarrhal appendicitis—the sclerosed appendix.

In Case III the appearances of the appendix are described.

In both cases the lumen was disturbed by the traction of adhesions to adjacent structures. In neither case was the cæcum thickened, as one might expect if amoebic invasion were present. In both cases, also, there had been repeated attacks, pointing to an appendicitis which had resolved to some degree. Had the infection in the organ been amoebic in the first instance, would the condition settle down speedily without specific treatment?

An authority (Rogers, 1930) emphasizes the importance of not mistaking thickening of the cæcum in chronic and latent amoebic bowel affection for appendicitis and the need, where the symptoms are not of an urgent nature, of a short course of emetine, before submitting a patient coming from an area where amoebiasis is endemic to what may be a needless operation.

Another writer (Manson-Bahr, 1935) has the impression that certain intestinal conditions occur frequently as an aftermath of amoebiasis—among them “certainly appendicitis (not necessarily caused by amoebic ulceration).”

There are certainly a number of cases of amoebic dysentery which do not clear up completely with repeated courses of the orthodox medical treatment, who eventually present symptoms of appendicitis of a subacute type, and finally are submitted to operation. In these amoebic ulceration is commonly present.

Case IV.—Unusual manifestation.

An officer, aged 52, was examined on December 26, 1935, for a tumour in the right side of the abdomen. For the previous two weeks he had been treated in his quarters for “gastritis,” and during the last two days there had been fever. Two blood-films had shown no malaria parasites.

He was a heavy, pale-faced man complaining of an irritating cough and of pain and distension in the abdomen. Temperature was 102° F. Pulse regular, 88. The abdomen was moderately distended. On the right side a hard smooth mass could be felt, extending from the 10th and 11th costal cartilages at the costal margin to the right iliac fossa where its lower limit was indefinite. Seven inches broad at its widest, the mass had a hard, smooth, well-defined medial border, and the lateral border was lost in the fat and muscles of the flank. The whole tumour was dull to percussion, tender to pressure, with a maximum intensity three inches to the right of the umbilicus. It did not move with respiration. There appeared to be some fulness, but no tenderness in the right costovertebral angle. The

liver dulness was normal except at the 10th and 11th costal cartilages, where it was continuous with the dulness over the tumour. Radiograms showed a normal-sized liver. A few scattered rhonchi were noted in each lung.

Clinically the case suggested a right perinephritic abscess; diverticulitis of the ascending colon; malignancy of the ascending colon with faecal accumulation; appendiceal abscess; amœbiasis of the hypertropic type.

On more detailed interrogation, the patient disclosed that he had lost some weight in the last month. He had had "a touch of dysentery in Mesopotamia" in 1916 and again in September, 1934; for the latter, two emetine injections had been given. The centrifugalized urine showed no pus cells. Blood examination showed: Leucocytes, 14,000 per cubic millimetre. Arneth count a marked shift to the left. Differential count: Polymorphs 84 per cent, lymphocytes 14 per cent, large mononuclears 2 per cent. After a barium meal there was normal emptying of stomach and bowel. The ascending colon showed a little more haustration than usual. Part of the transverse colon showed a "mouse-eaten" appearance.

Fæces: No blood or mucus. No *E. histolytica* or cysts.

Amœbiasis of the cæcum and ascending colon seemed the probable diagnosis.

Daily emetine injections were commenced. The temperature fell to normal within three days and the tumour in the abdomen became smaller day by day in the most remarkable way. At the end of a week's treatment it felt like an ordinary thickened colon, such as one commonly finds in cases of chronic dysentery. At the end of twelve injections (twelve grains of emetine hydrochloride) the patient left hospital and soon returned to duty. A further short course was given later. When seen at the end of six months he was fit. The ascending colon remained somewhat thickened on palpation. There had been no recurrence at the end of fourteen months.

Twelve consecutive examinations of the fæces, in this case, failed to disclose vegetative or cyst forms of E. histolytica.

Comment.—The hypertropic form of intestinal amœbiasis does not appear to be very common among Service patients. I have seen three cases in India in nine years. The others were less well marked than the case quoted.

Referring to this amœbic granuloma, an authority (Manson-Bahr, 1935) describes the process as "an isolated ulcer, with progressive erosion of the bowel wall in response to long continued secondary infection. Large amounts of œdematous granulation tissue appear, and the process may affect the entire bowel wall and the neighbouring mesocolic fat."

Case V.—Medical history negative. Unusual manifestation.

A private, aged 21, reported sick on January 20, 1936, complaining of a lump in the pit of the stomach. He was admitted the same day for investigation.

He had never been abroad before coming to India eighteen months ago. He stated he had not had diarrhoea or dysenteric symptoms at any time. He had an attack of lobar pneumonia (both bases) in November, 1935, and appeared to have fully recovered. On Christmas Day he felt pain in the lower part of the chest on deep inspiration. About January 8 he "felt full and heavy in the stomach" and he noticed the lump. There was no history of trauma or of vomiting.

He was a fresh-complexioned, fit looking young man. Temperature 100° F. Pulse 87. Respirations 18. In the abdomen a swelling the size of a large fist could be seen and felt in the left epigastric area. It felt tense and smoothly rounded. Dull to percussion with the tympanitic stomach note distal to it, the tumour moved with respiration. It appeared to be attached deeply in the left hypochondrium and superficially to the parietes beneath the upper third of the left rectus. Its appearance closely resembled a pseudocyst of the pancreas such as often follows trauma, except that it moved with respiration. Leucocyte count was 16,000 per cubic millimetre. Differential count was not recorded. Arneth count, slight shift to left. Radiograms showed a generalized enlargement of the liver. The lower border of the left lobe was not clearly defined.

An injection of one grain of emetine hydrochloride was ordered, preparatory to aspiration and/or exploration the following day.

In the theatre, two attempts at aspiration failed, and the tumour was exposed through an upper left paramedian incision. The left lobe of the liver was found to be greatly enlarged in a downward direction (within two fingers' breadth of the umbilicus). It contained in its substance an abscess the size and shape of an egg, with the long axis lying in the sagittal plane. The thick grumous pus which the cavity contained was wiped out with gauze and the cavity packed. Daily injections of emetine were continued, and the temperature came to normal within three days. From the cavity there drained a very small quantity of anchovy-sauce-like material. The liver enlargement disappeared in the course of a week, and an uneventful convalescence followed.

Laboratory investigation of the abscess contents disclosed "a Gram-negative bacillus, not coli group." Eight consecutive examinations of the faeces did not reveal *E. histolytica* cysts.

Comment.—It is a remarkable thing that there is comparatively little constitutional disturbance in some liver abscesses. This case is an illustration. If one had not used a thermometer or seen the swelling the patient might well have been considered fit.

In this patient I was a little uncertain of the pre-operative diagnosis. Puncture is not considered a particularly safe procedure below the left costal margin (Rogers, 1930) and only two attempts were made. The abscess contained, at most, two ounces of debris, and might have been absorbed without active intervention with emetine. And yet it does not do to be over-dogmatic on this point as the following chastening experience

will show. In 1934 I was called to see a man, aged 52. He had been diagnosed acute amoebic hepatitis six days previously, and had received five emetine injections. The physical signs were definitely those of involvement of the upper right lobe. The temperature had fallen gradually and the liver enlargement seemed to be decreasing when he developed a sudden and very acute abdominal pain. A small abscess on the upper surface of the right lobe had leaked and a general peritonitis had resulted. The patient died.

CONCLUSION.

A number of difficulties in the diagnosis of secondary amoebiasis are illustrated by case records. My main interest in the subject is its surgical aspect, but at the risk of indulging in a hackneyed topic, these remarks on aids to the diagnosis are ventured.

A careful, and until the diagnosis is settled, a daily repeated clinical examination of the patient is essential.

The leucocyte count gives very useful information. A moderate leucocytosis of between 10,000 and 20,000 per cubic millimetre is usual in these cases. The polymorphonuclears are present in little over normal proportion, and where invasion by secondary organisms has not occurred, one higher than 85 per cent need not be expected. Where the leucocyte count is low a red cell count should be done. It may reveal a relative leucocytosis. It must be remembered that anæmia is often present (Rogers, 1933). The Arneth index, or one of its modifications, is helpful in association with the other findings. It is of great use in prognosis.

Radiography and examination with the sigmoidoscope yield rapid and often definite information.

Microscopical examination of the stools may shed light on the obscure case. In the cases described the results are disappointing, but this is unusual. The method has its limitations. It is well to recall that though the discovery of *E. histolytica*, in one or other of its forms, justifies a diagnosis of amoebiasis, this by itself does not imply that the patient is suffering from amoebic dysentery or indeed any other amoebic disease (C. Dobell and G. C. Low, 1922).

When the organism is found in association with an appropriate clinical picture, it clinches the diagnosis.

Let me here diverge for a moment to an aspect of disease in which we, as a Corps, are now mainly interested—Prevention!

Are we doing everything possible to prevent the development of these cases of amoebiasis? It is not uncommon to see a patient with a relapse of dysentery treated several times with salines and starvation. Despite all care his bowel symptoms never quite clear up. His health and morale deteriorate; he may become the wreck of a man. Then one day the glad news spreads through the hospital. The wandering amoeba has been found! The "scientific" honour of medicine has been satisfied! And the patient receives his long delayed emetine. In the treatment of recurrent dysenteries

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in ordinary practice, many eminent and experienced men tell me that they give adults a course of emetine as a routine. Let us use our microscopes by all means, and also our common sense. Huxley's definition is relevant—"Science is nothing but trained and organized common sense."

To return to the main theme—in emetine we have a drug of unique value in diagnosis and in treatment. With the ordinary precautions we can do no harm and a great deal of good by using it. It has the merits of rapidity and definiteness in its action. A few doses—at most six—will indicate whether or not we are dealing with a case of amœbic infection.

I wish to express my thanks to Lieutenant-Colonel H. D. F. Brand, R.A.M.C., Officer Commanding, British Military Hospital, Meerut, and to Colonel S. G. S. Haughton, C.I.E., O.B.E., I.M.S., Assistant Director of Medical Services, Meerut District and Delhi Independent Brigade Area, for permission to submit these notes for publication.

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THE ORGANIZATION AND USES OF A MOTOR AMBULANCE CONVOY.

BY MAJOR P. J. S. O'GRADY,
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"IN the interests of humanity it is important that no man unfit to withstand the stress of battle should remain in the area of actual combat, or in its close vicinity, a moment longer than is necessary. An organization for the evacuation from the battlefield, as completely as possible, of all that is no longer required, will be put into force at the outset of a campaign. The furtherance of this object by troops, staff, and services collectively, and by each individual to the best of his power, is the duty of all." (Field Service Regulations, Volume I.)

Chief among the medical units concerned in the evacuation of casualties is the Motor Ambulance Convoy, and as it has been my lot to command one during the recent emergency in Egypt, perhaps a few notes on its organization and working may be of some use. In writing these notes very little originality is claimed.

(1) MOBILIZATION, ALLOTMENT, AND RAISON D'ETRE.

Motor Ambulance Convoys are utilized for clearing the sick and wounded from field ambulances to casualty clearing stations, and very often from casualty clearing stations to ambulance trains. They are usually allotted for this purpose as G.H.Q. troops in the proportion of one to each corps in the field. Usually under the direct orders of the D.M.S. they are, on occasion, placed under the orders of a D.D.M.S. Corps, a certain proportion, however, being retained in reserve by G.H.Q. at some convenient centre for disposal as necessary in emergency.

Generally speaking the work of a Motor Ambulance Convoy is in some respects analogous to that of an ammunition company. Both units are liable to periods of intensive work with all available vehicles operating continuously, punctuated by days of comparative inactivity. Like an ammunition company the calls on the services of the M.A.C. vary in direct proportion to the magnitude and duration of operations. During the Great War it was quite a common occurrence for M.A.C.s to work all their vehicles continuously for periods of forty-hours or more. In view of the severity of such a test it is obviously the duty of the Commanding Officer to ensure that, during periods of quiescence every effort is made by rest, recreation, inspection, and maintenance, to keep his command up to a high standard of physical and mechanical efficiency.

(2) WAR ESTABLISHMENT AND ORGANIZATION.

A Motor Ambulance Convoy (M.A.C.) is a mobile medical unit, commanded by a R.A.M.C. officer of field rank. It comprises a medical wing and a transport wing, and is organized as a H.Q. and three sections, each of 25 motor ambulances. The medical wing consists of 2 officers, R.A.M.C., 1 warrant officer (quartermaster serjeant), 3 N.C.O.s (serjeants, one to each section), and 24 other ranks, R.A.M.C. (including 1 corporal).

The transport wing has 6 officers, R.A.S.C., 2 warrant officers (a company serjeant-major and a mechanist quartermaster-serjeant in H.Q.), 8 N.C.O.s (a company quartermaster-serjeant, a mechanist staff-serjeant and 3 serjeants in H.Q. and one serjeant with each section). There are 168 other ranks R.A.S.C.

The senior R.A.S.C. officer is a captain and is hereinafter referred to as the O.C. transport wing.

The transport wing is organized into a H.Q. and three sections. The headquarters include the usual personnel for administrative and technical duties, and is provided with mobile repair facilities on the normal field scale (one sub-section for each forty-two lorry units). Included in headquarters are two R.A.S.C. subalterns, one of whom is allotted for workshop duties. The unit is thus self-contained in the matter of second line repairs. Each section, commanded by a subaltern, has a section serjeant, and a motor cyclist for the maintenance of communications.

Transport, as in all mechanized units, is classified into first and second line. First line consists of 2 heavy motor cars, 1 light Austin car, 5 motor-cycles, 2 six-wheeled medium lorries for technical stores and equipment, 1 breakdown lorry, 4 other lorries for workshop and stores, a trailer kitchen and a trailer water tank. All these vehicles are in H.Q. Each of the 3 sections has a light Austin car, 2 motor-cycles, and 25 six-wheeled motor ambulances. Second line consists of 2 light (30 hundredweight) lorries for baggage and supplies and is provided by the R.A.S.C. troops according to the formation to which the M.A.C. is allotted.

(3) DUTIES OF PERSONNEL.

It is important to have a clear understanding of the duties of the O.C., M.A.C., and of the extent to which they can be delegated to his subordinates.

These responsibilities may be summed up as follows : (a) The detailing of sufficient vehicles to ply between each M.D.S. and C.C.S., keeping a reserve in hand to meet reliefs and emergencies ; (b) reconnaissance of routes ; (c) ascertaining during operations that each M.D.S. and C.C.S. served by his cars is adequately supplied with transport ; (d) feeding and resting of drivers and medical orderlies ; (e) arranging supplies of petrol, tyres, etc., in easily accessible spots, to obviate the necessity of vehicles returning to unit headquarters ; (f) ensuring that supplies of stretchers, blankets, splints, etc., at the M.D.S. are kept up to requirements.

Similarly it is necessary to visualize the responsibilities of the O.C.,

Transport Wing. He is responsible to the O.C., M.A.C., for all executive duties in connexion with the conveyance of casualties. R.A.S.C. Training, Volume II, Section 12, lays down that the senior R.A.S.C. officer—who is the O.C. transport wing—is responsible to the representative of the D.S.T. at the headquarters of the formation that R.A.S.C. technical duties are carried out in accordance with the policy of the D.S.T. This dual responsibility from the unit point of view sometimes leads to difficulties in administration. The view I take is, that although the O.C. transport wing is responsible for technical matters to his own directorate, all correspondence dealing with such matters should in the first instance be brought to the notice of the O.C. unit, and either signed by him, or by the O.C. Transport Wing for him. Direct correspondence between "O.C. Transport Wing" and the "R.A.S.C. directorate" is liable to misunderstanding and creates difficulties, as the O.C. unit is by this procedure often kept in ignorance of matters of which he should be aware.

Of the three R.A.S.C. officers on the establishment of headquarters it will be convenient to make one responsible for pay arrangements, one for messing, and one for clothing and equipment. Of the Warrant Officers, the R.A.M.C. quartermaster-sergeant is best employed in charge of medical equipment—which should be accounted for on a separate ledger—and for returns of a purely medical nature. Of the two R.A.S.C. Warrant Officers, the company serjeant-major is responsible for the discipline of the unit and the mechanist quartermaster-sergeant is employed on his specialist duties with the workshop section. There is a company quartermaster-serjeant (a staff-serjeant) to whom should be delegated the routine duties in connexion with ordnance equipment and clothing, and he should maintain the requisite ledgers. In addition he makes a very useful chief clerk. The clerk (a corporal) is found by the medical wing, the R.A.S.C. clerks being technical mechanical transport personnel.

The various tradesmen are responsible for their special duties.

Drivers should not be used to handle stretchers unless it is absolutely necessary.

(4) TACTICS.

Before discussing the detailed functions of a M.A.C., it is useful to have a clear conception of the role and distribution of the other medical units involved.

Normally each division taking part in operations will establish one M.D.S., so that a M.A.C. allotted to a Corps will have to clear at least two, and possible three M.D.S.'s; all of which may be receiving and evacuating casualties simultaneously. Casualty Clearing Stations on the other hand, though provided on the scale of one for each division, will not normally receive casualties simultaneously; and R.A.M.C. Training visualizes the following C.C.S. state of affairs: (a) *Each C.C.S. may receive all patients, in turn, for a certain period; varied according to rate of influx; (b) during static*

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warfare C.C.S.'s may be grouped to facilitate working; (c) during a rapid advance C.C.S.'s may be employed in echelon, i.e. one working, one packing up, and one on the move forward to a new site.

It will be convenient to consider the handling of the M.A.C. in connexion with each of these three methods. It will be noted that R.A.M.C. Training does not visualize each M.D.S. normally evacuating casualties exclusively to one allotted C.C.S. thus involving—in a corps—two or three separate collecting points and two or three corresponding delivery points. In the exceptional circumstances in which this occurs the O.C., M.A.C. would in all probability allot one section to clear each M.D.S. to its corresponding C.C.S.; and the three-section organization of the M.A.C. is well adapted to this method of operation. In all instances of sections operating independently the maintenance of communication with unit headquarters is of first importance, and this is best achieved by the allotting of one of the pool of four motor cycles to each detached section. In any case, it is evident that, even with all three C.C.S.'s in operation simultaneously, no more than two sections will be detached as the headquarters of the convoy will be situated in the vicinity of one of the C.C.S.'s.

The working of C.C.S.'s on the lines indicated in (a) above will facilitate centralized control of the M.A.C. During periods of minor operations it will very probably be convenient to arrange alternate periods of duty for sections. Other things being equal, the period of section duty can coincide with the period that each C.C.S. is receiving. It must always be remembered however that a certain number of ambulances may be required by a C.C.S., which, although closed for receiving patients, is engaged in evacuating to an ambulance railhead, for the reason that, although Field Service Regulations, Volume I, emphasizes the desirability of C.C.S.'s being provided with rail connexion to ambulance railhead, this is not always possible—particularly in mobile warfare. Consequently R.A.M.C. Training (Section 250) lays down that "the M.A.C. may also be detailed to clear the C.C.S. to the ambulance train if there is no railway siding to the C.C.S." This very often occurred in the Somme area during periods of advance.

The grouping of C.C.S.'s possesses obvious advantages from the aspects both of administration and evacuation, consequently our Training Manual emphasizes the advisability of locating these units in pairs, or even in threes, if heavy casualties are anticipated. The localization of the M.A.C. in the vicinity of these grouped C.C.S.'s will facilitate centralized control, the arrangements for feeding and resting personnel, the maintenance and refuelling of vehicles, and a fair distribution of duties. During the Great War one M.A.C. devised a working system somewhat as follows. The workshop personnel made a large clock-like dial with a movable pointer, having on its periphery a series of detachable discs numbered 1 to 75. Ambulance cars were similarly numbered, and a N.C.O. was put in charge of the "Clock." When No. 1 ambulance went out, the N.C.O. moved

the pointer to No. 2; and so on. The index numbers of non-effective vehicles were detached and placed in a separate holder. By due observance of the clock each N.C.O. knew what vehicles were to stand by and each section commander knew what section was next for duty.

During a rapid advance the M.A.C. would most likely be disposed in echelon in conformity with the movements of the C.C.S.s. The headquarters and two sections would probably be located with the C.C.S. actually working, while the other section would accompany the C.C.S. moving up to the new position. The commander of this detached section should select his site with a view to its becoming, later on, the headquarters of the M.A.C. in the event of a further advance.

As changes of railheads normally take about three days to effect, the two sections accompanying the operating C.C.S. will in a rapid advance almost certainly be called on to evacuate from the C.C.S. to ambulance trains. The M.A.C. by utilization of its medical wing can, if necessary, replace an ambulance train over a limited distance, as it provides both transport and medical care during transit. In practice, however, every effort is made to site C.C.S.'s within easy reach of ambulance rail or river-heads, as the existing scale of allotment of M.A.C.s does not permit of these units making long journeys to rear areas without interfering with the efficient performance of their primary function; i.e. the clearing of casualties from field ambulances to C.C.S.'s.

(5) INTERIOR ECONOMY.

The distribution of vehicles for work between M.D.S.'s and C.C.S.'s, and the numbers to be retained in reserve, is a question to be decided by the O.C.; but the allocation of duties to sections or sub-sections will normally be left to the O.C. transport wing. The size of the reserve to be retained at headquarters depends on circumstances—for instance when only one C.C.S. is receiving it may be found possible to use one section only, the other two being then regarded as in reserve. When all three sections are evacuating casualties simultaneously, a few vehicles must be withdrawn from each section, and these vehicles may be grouped in reserve under one of the R.A.S.C. subalterns at M.A.C. headquarters. This reserve quota is available to replace casualties to vehicles, or to reinforce a section unable to cope with the influx of wounded. Should the incidence of casualties be so heavy that the M.A.C. as a whole cannot deal with it, the O.C., M.A.C. will have to notify the D.D.M.S. of the Corps with a view to reinforcement from the reserve M.A.C. at G.H.Q. This position is most likely to arise during a rapid advance when C.C.S.'s are sited some distance in front of ambulance railheads.

(6) RECONNAISSANCE.

The reconnaissance of routes is a very important factor in the evacuation of casualties. This duty is best delegated to the O.C. Transport Wing. Reconnaissance parties should be as strong as possible and should include

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representatives of the sections likely to use the areas reconnoitred. The ideal to be aimed at is for all officers, N.C.O.s and motor-cyclists to be familiar with the routes, and with any special orders that may be issued in connexion with traffic control.

(7) CAR POSTS.

R.A.M.C. Training, Section 442, lays down that a car post will be established close to the M.D.S. This post—somewhat analogous to an ammunition point—is a point at, or near which, empty ambulance cars are located in readiness to proceed to the M.D.S. at short notice when required. The object is to avoid congestion in the vicinity of the M.D.S. During the preparation for a deliberate attack such posts can be selected in advance by a reconnaissance party, but in mobile operations the selection will probably devolve on the section officers, as nothing can be done until the locations of the M.D.S.'s are known. The exact location of the car post is determined by two main factors: (a) It should be sufficiently close to the M.D.S. to prevent delay in the supply of empty ambulance cars; (b) the necessity for finding adequate parking space clear of the main road in order to avoid congestion and observation. These factors may prove conflicting and the selection will frequently be a compromise.

(8) LIAISON WITH M.D.S.'s.

There are only two ways by which the O.C., M.A.C. may satisfy himself that evacuation from the M.D.S. is proceeding satisfactorily: (a) By personal visits; (b) through the reports of his subordinates.

Personal visits should be made by the O.C. and his O.C. Transport Wing in turn, thus ensuring that both the medical and transport aspects are receiving attention, and that both officers are not absent from headquarters at the same time. Section officers' reports are a valuable guide to the situation. Information of little pressure is always useful as it enables vehicles either to be drawn into reserve from a lightly-worked section, or to be switched over to accelerate the clearance from another M.D.S. which may be in danger of congestion. Thus the importance of maintaining communication between sections and headquarters is emphasized, and as each section has only one motor-cyclist one of those from the pool at headquarters can be allotted to any section which is detached.

(9) FEEDING AND REST.

The conservation of energy by means of adequate food and rest is of great importance during periods of intensive operations. The M.A.C. is provided with one kitchen trailer and a normal proportion of camp kettles. Whenever possible messing should be centralized, and, as mentioned above, one of the R.A.S.C. subalterns at headquarters should be detailed as messing officer. When sections are in action the resting and feeding of drivers becomes the responsibility of section commanders. The issue of

small-formation cooking sets is a matter which should receive attention at an early stage.

(10) FUEL.

Stocks of petrol and lubricants at sites so as to avoid diverting vehicles for refuelling should always be arranged before periods of activity. When only one C.C.S. is receiving, the petrol dump can be placed in charge of a N.C.O. from M.A.C. headquarters, and should be located somewhere near the exit from the C.C.S., so that drivers can refuel immediately after off-loading. Similarly, small stocks of petrol will have to be dumped at sites convenient for detached sections. This distribution is the responsibility of the O.C. Transport Wing. Petrol consumption will vary in ratio to the incidence of casualties, and is therefore difficult to forecast with any degree of accuracy. The type of motor ambulance now in use has a tank capacity of about seventy miles, but this vehicle is gradually being replaced by a type possessing an increased range of action due to the provision of a larger tank.

(11) MEDICAL AND ORDNANCE EQUIPMENT.

"In order to maintain the supply of stretchers and surgical appliances in M.D.S.'s, it is important that each car on unloading its patients at a C.C.S. should receive the same number of stretchers, blankets, splints, hot bottles or other appliances as are handed in with the patients" (R.A.M.C. Training Section 254). This is a matter which is very often overlooked, either at the early stages of a campaign when personnel are not quite *au fait* with their duties, or again during periods of great activity when expedition is often of great importance. It is, however, a very essential detail, and section N.C.O.s should impress its importance on both R.A.M.C. and R.A.S.C. personnel very early in the campaign. R.A.S.C. personnel are primarily responsible, as stretchers form part of their vehicle equipment.

(12) SECTION TECHNIQUE.

During periods of actual operations a great deal of responsibility devolves on the R.A.S.C. subalterns commanding sections. As mentioned above, sections may either be employed in rotation, or each section may be allotted the duty of clearing one M.D.S. In the latter case, one, or possibly two, of the sections may be working more or less independently, according to the siting of C.C.S.'s; as it will neither be possible nor desirable to move M.A.C. headquarters each time the duties of "reception" are changed from one C.C.S. to another. As the situation will depend upon such variable factors as distance, rate of casualties, and condition and number of roads, it is impossible to do more than suggest the general principles for the operation of a section working independently.

Section headquarters is best located somewhere in the close vicinity of the C.C.S. concerned, and should be sited on the direct return route from

C.C.S. to M.D.S. In addition to a small stock of petrol, lubricants and tyres, a supply of ready cooked food should be available to enable drivers and orderlies to obtain refreshment without delay. Section N.C.O.s can be employed as follows: The serjeant to take charge of section headquarters, and one corporal to take charge of the car post mentioned in paragraph 7. These N.C.O.s can be relieved by the remaining two corporals located at section headquarters, when off duty. The spare drivers, of whom there are eleven, can also be kept at section headquarters, and utilized as reliefs. Drivers can thus work in shifts of, say, eight hours "on" and four hours "off." It may also be found advisable to allot to any section working independently one or more fitters to carry out minor repairs; thus obviating the necessity of diverting vehicles to the workshops.

The duties of the N.C.O. in charge of section headquarters may thus be summarized: (a) To ascertain by personal inspection that each ambulance car returning from C.C.S. to M.D.S. is in possession of the splints and other medical supplies mentioned in paragraph 11. (b) To ensure that vehicles are filled up with petrol, oil and water. (c) To supervise the relieving and feeding of personnel. (d) To eliminate delay in the despatch of empty vehicles to the car post. (e) To report casualties in personnel and vehicles to M.A.C. headquarters.

As the section serjeant is provided with a motor-cycle he can easily maintain communication by using one of his spare drivers. During periods of intensive running necessitating an immediate turn round of vehicles, it might be advisable for section headquarters to organize a "maintenance squad." The duties of this squad may be likened to those of a pit crew during motor racing. Whenever a vehicle reports to section headquarters the driver is given food, while the serjeant inspects the car and medical equipment. Simultaneously a fitter makes a rapid inspection and carries out any necessary minor adjustments. A third man fills up with fuel. This routine is an emergency measure, and is in no way intended to nullify the driver's responsibility for his own vehicle.

The N.C.O. in charge of the car post acts as a control. Although not mounted he will be able to maintain communication both with the M.D.S. and the section headquarters by despatching messages with the drivers. Furthermore, the motor cyclist at the M.D.S. will normally pay frequent visits to the car post. Any sudden fluctuation in influx of casualties to the M.D.S. will have a direct bearing on the situation at the car post. During rush hours, when every effort must be made to keep the M.D.S. clear, the car post is little more than a control point, with few, if any, vehicles standing by. When evacuation is on the wane, the car post will fill up with empty vehicles. When the number previously decided on by the O.C., M.A.C., has accumulated, the N.C.O. in charge must notify section headquarters, so that the remaining vehicles may be held there, and personnel rested and fed.

The section commander should ascertain by frequent visits that the

M.D.S. is being effectively cleared. Should he find that the influx of casualties is more than he can deal with, he must apply to the O.C., M.A.C., for an allotment of vehicles from the reserve. He should also keep in close touch with the petrol situation at section headquarters to ensure that demands for replenishment are sent to the O.C. Transport Wing in ample time. When sections are operating in rotation the outgoing section commander should ensure that his successor is familiar with the routes, the exact location of the M.D.S. and car post, and with the situation generally. To ensure continuity, the relieving section commander should traverse the route with his predecessor before taking over, and he should be accompanied by his section serjeant and motor cyclist. Section commanders, N.C.O.s, and motor cyclists, should invariably be supplied with maps.

(13) GENEVA CONVENTION.

Some doubt appears to exist as to whether the arming of personnel operating under the aegis of the Red Cross constitutes a violation of the Geneva Convention, and it is considered desirable to make this point clear. Article 6, Chapter II, of the Convention (1929), states that "Mobile medical formations, that is to say those which are intended to accompany armies in the field, and the fixed establishments of the medical service shall be respected and protected by the belligerents." Article 8 goes on to say the following conditions are not considered to be of such a nature as to deprive a medical formation or establishment of the protection guaranteed by Article 6 :—

(i) That the personnel of the formation or establishment be armed and that they use the arms in their own defence or in that of the sick and wounded in charge.

(ii) That in the absence of armed orderlies the formation or establishment is protected by a piquet or by sentries.

Article 9 also lays down that personnel engaged exclusively in the collection, transport and treatment of the sick and wounded shall be respected and protected in all circumstances.

Article 21 further stipulates that the personnel in respect of whom protection is claimed must wear an armlet bearing the distinctive sign, and must be provided with a certificate of identity consisting either of an entry in their small book (pay-book), or a special document.

In compliance with the policy indicated in the above-quoted Articles, rifles are provided for the R.A.S.C. personnel, and Red Cross brassards for all the personnel on the strength of the unit. The O.C., M.A.C., is responsible for ensuring that the pay-books of all unit other ranks are endorsed with a certificate that they are employed exclusively in the transport of sick and wounded. He should also provide all officers in the unit with a certificate to the same effect.

(14) CONCLUSION.

During the recent emergency in Egypt the duties which No. 3 M.A.C. carried out were practically those that would normally be done by an Ambulance Car Company (R.A.S.C.), at a base. The organization of both these units is practically the same, but the latter has no medical personnel on its establishment. Casualties were evacuated bi-weekly from the ambulance train—which ran from the Libyan Desert to Alexandria—to No. 3 General Hospital at San Stefano, a distance of about eight miles. Casual sick from local camps were collected and transported to hospital, and transport and personnel were found for these camps. Certain of our medical personnel were attached for duty to the military medical establishments at Cairo, Alexandria, and Moascar, and had the advantage of undergoing the technical training required for the Corps examinations. They were subsequently able to sit for examination and the unit had very few failures.

One section remained in the Cairo Area, and one sub-section went to Libya.

Our unit workshops, in addition to carrying out its normal duties, for some time functioned as an area workshops, and was responsible for the maintenance of quite an appreciable amount of extra-unit transport.

Certain statistics which I kept up are unfortunately not now available, but from memory I would estimate that we transported close on 3,000 patients, and our wheels turned nearly 60,000 miles.

We were involved in about seven traffic accidents, one of which was unfortunately fatal, resulting in the death of the French commercial attaché at Alexandria.

We moved to Palestine in October, 1936, and almost immediately ceased to exist as a unit.

We had our periods of recreation. Previous to embarkation we had collected the nucleus of a sports fund from the various companies from which personnel were drawn, and this was augmented overseas by contributions from Army Headquarters in Egypt, D.D.M.S. in Egypt, and the Transport Directorate in Egypt. We had a hockey team, a cricket team, and a football team, and were able to participate in competition with other units and with civilian teams. We had our own N.A.A.F.I. Canteen producing a monthly rebate of about forty pounds, and a residual sports fund of over £170 was handed to the joint trusteeship of the Transport and Medical Directorates in Palestine when the unit ceased to exist.

It is rumoured that the M.A.C. may possibly become a purely transport (R.A.S.C.) unit in the future, and the question arises, can casualties be transported by such a unit without detriment to their welfare? It is not, in my opinion, a very easy problem to solve.

In actual warfare, in which an M.A.C. would be expected to carry out its normal duties, i.e. the transport of casualties from M.D.S.'s to C.C.S.'s,

I would at once say NO. Serious cases will always need medical attention even on short journeys, and the elimination of R.A.M.C. personnel would therefore be detrimental to the welfare of casualties. Emergency treatment for cases in transit will always form part of the evacuation process, and R.A.S.C. personnel cannot be expected to undertake this responsibility. Neither would the attachment of medical personnel to a purely transport unit be a very suitable solution, as in this case the care of casualties might very possibly become subsidiary to ordinary transport duties—not a very happy state of affairs, possibly resulting in the undue delay of casualties arriving at field medical units.

On the other hand, the transport of casualties from ambulance trains to general hospitals at bases can very easily and very efficiently be carried out by purely transport units.

THE LOG OF THE "SEABIRD" OSPREY.

BY MAJOR E. F. W. MACKENZIE, O.B.E., M.C.

Royal Army Medical Corps.

WHILE spending two months' leave fishing and shooting at Karwar, a coastal village of Southern India some three hundred miles south of Bombay, I was impressed by the excellent sailing that might be enjoyed with that port as headquarters, and I determined that, if ever the opportunity should arise, I would take a sailing boat there.

The following year I was granted six weeks leave in November and December. As my sailing partner was departing on a trip to East Africa our small ship was available, and I determined to set out.

At that time I was sailing "Osprey," a Clyde designed centreboard boat of the Royal Bombay Yacht Club's "Seabird" one design class. Her dimensions were as follows:—

Length overall 21 ft., length waterline 19'75 ft., beam 7'68 ft., centreboard 300 lbs., draft with centreboard 6 ft., displacement 23½ cwt.

She was gunter sloop rigged with a sail area of 270 sq. feet and large racing spinnaker which I later succeeded in setting as a balloon jib, thus considerably increasing my speed when reaching in a light breeze.

She was half-decked with a large sail and gear locker forward and a small locker aft, both watertight or nearly so. These provided accommodation for little more than ship's gear and the tindal or deck hand who preferred to sleep below decks. There was, therefore, no dry accommodation for the comparatively large amount of gear necessary for a long cruise, nor was there room on the floorboards to lie stretched out for sleep. Some modification was therefore necessary. The fitting of hatches solved both difficulties. They were accurately fitted to lie with outer ends resting on the thwarts, inner ends on the centreboard casing, and could be removed in sections. They provided a sort of upper deck on which it was possible to stretch at ease and accommodation below for kit which was kept reasonably dry at all times except when water was shipped in quantity. The height from this upper deck to the coaming was less than one foot, which allowed the lightest breeze to play on one's face and wake one up, a matter of some importance as it was desirable to take advantage of every breeze.

Although an excellent little seaboat, "Osprey" suffered from two serious disadvantages for ocean cruising which are common to all centreboard boats. She could not be hove to in a rough sea, nor would she hold a course with the tiller lashed. The former was overcome to some extent by running before the wind under a storm jib in foul weather. The latter could not be remedied, and since the tindal, though in other respects a

good fellow, was reduced to a state of abject panic in a stiff blow, long hours at the tiller were necessary. The preparation of hot meals while at sea was, for this reason, out of the question.

All preparations were complete and I went aboard, after a farewell pint of excellent beer in the Royal Bombay Yacht Club, before midnight on November 17 preparatory to getting away early on the 18th.

I decided not to attempt to tow a dinghy and to swim ashore when no other means of getting there was available.



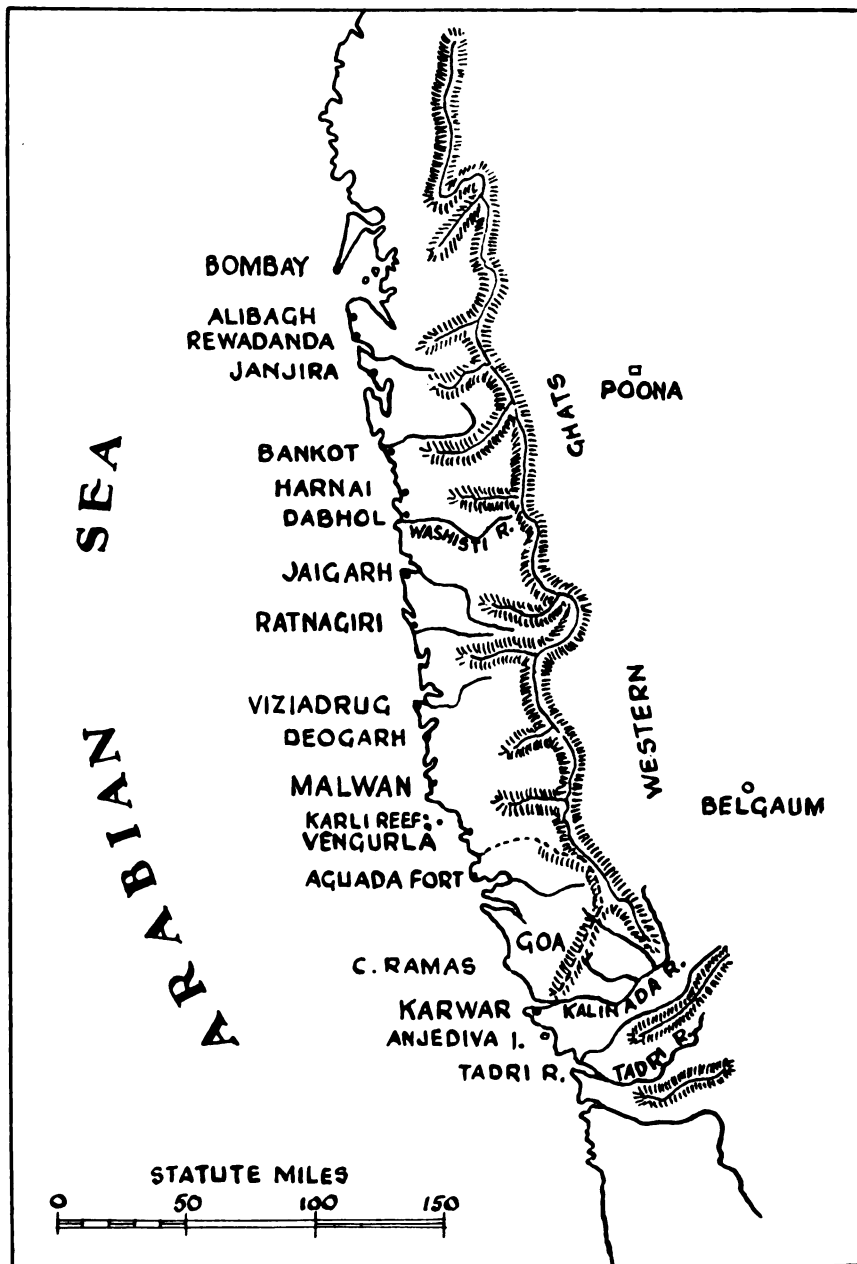
"Osprey," Royal Bombay Yacht Club.

Nov. 18.—I dropped my moorings and got away on the morning breeze at 6 a.m. At 8 a.m. passed between Kennery Islands and the mainland. At 9.30 a.m. the s.s. "Padmavati" overtook us southward bound and showed us the way through the fishing stakes, of which there are large numbers south of Kennery extending a long way out to sea. Sea smooth with a nice breeze abeam or on the port quarter. The Bombay Steam Navigation Co.'s s.s. "Lilivati" bound north passed at 10.30.

Off Alibagh outer reef buoy at 10.45—a dead calm.

12.15 p.m. : A light breeze from NE. came at 11.15 and lasted fifteen

minutes, when it fell dead calm again. The first of the sea breeze shortly afterwards came from the west and I set a course S. by E. towards Janjira.



At 4 p.m. a heavy thunderstorm came up over the Western Ghats and appeared to be making towards us.

9.30 p.m. : The storm came seawards, circled round "Osprey" and made me reef, and then passed out to sea. About 6 p.m. it fell dead calm but with the aid of light airs from NW. I eventually reached an anchorage off the Nawab's palace in Janjira harbour, in $3\frac{1}{2}$ fathoms mud bottom about 3 cables from the beach, at 7.15 p.m.

I had hoped to reach Kumbaru Bay but the storm and succeeding calms prevented my doing so.

To-day's rations were eggs, bread and butter, marmalade, sausage rolls, curry puffs and a chicken, all of which had been prepared the night before embarking. Two thermos flasks full of crushed ice have been invaluable and are still going strong. If a flask is opened and water poured into it and out again at once it is sufficiently cooled and one flask makes many cool drinks.

I saw some surmai, large game fish of the mackerel family, leaping off Janjira but I have not yet got my fishing tackle ready.

To-day's run was $38\frac{1}{2}$ miles.

Nov. 19.—Wakened at 4.45 hrs. and had a swim and breakfast of tea, bacon and eggs cooked on the primus stove, bread, butter and marmalade. At 5.30 a light breeze came from SW. and I weighed anchor at 5.45 leaving Kansa Fort to port and passing close under Rajpuri Pt. and inside Whale Reef.

The wind has been well in the south and rather than beat down the coast I stood out to sea on the port tack all the morning. This was most refreshing after running all day yesterday. The breeze has now dropped, earlier than yesterday, and my watch has stopped. This is a nuisance as a clock I purchased for the cruise is losing 3 hours a day. I am trying to regulate it by sunset and until I do so times will be only approximate.

After about half an hour of calm the sea breeze is coming from due west.

The advantage of standing out close hauled on the port tack all morning is that, with the westerly wind, I can carry a spinnaker all afternoon; at least I hope so. I am aiming to reach Harnai this evening as the breeze is light.

Later.—Breeze freshening and I am carrying on to Port Dabhol.

10 p.m. : I held a good breeze all evening and reached my anchorage at 9.15 p.m. The only danger in making this port at night is a large sand bank on the north side of the entrance, and this can be avoided in approaching from the north by setting a course due south for Talkeshwar Point light until right under the cliffs.

In the absence of the usual instruments of navigation it is difficult to judge one's position when approaching cliffs upon which surf is beating at night. This is particularly so when the cliffs are surmounted by a lighthouse.

The intensely bright light and the roar of the surf on the rocks seem overwhelmingly near when actually some miles away, and from that

distance until a close approach is made one feels constantly that one is in imminent danger of running on the rocks.

Provided there are no outlying submerged rocks there is no justification for this feeling of alarm. When a very near approach to the surf is made the light comes quite rapidly almost overhead and the turmoil changes in character in a manner quite unmistakable. Provided also that conditions are not unfavourable and a good lookout is kept, the warning should come in ample time to enable one to sheer off.

When about two cables from the cliffs course was altered and after a somewhat complicated passage up the Washisti River, good anchorage was found near Dabhol—too late to go ashore.

I spent some time to-day making a trolling rod of male bamboos, with sheet cork handle and porcelain rings, for use until my split cane rod meets me at Karwar.

To-morrow I hope to reach Ratnagiri where I shall spend the morning oiling blocks and adjusting running gear. "Osprey" had not been sailed prior to leaving as she was late in fitting out and I was anxious to get away. To-day's run approx. 50½ miles.

Nov. 20.—Left Dabhol at 6 a.m. after bacon and eggs, fried potatoes, etc. I make tea for breakfast in a large pot and fill a thermos for afternoon tea, as I do not care to light the primus unnecessarily while at sea. There was still some ice in the second flask last night and I think I shall get my last cold drink to-day unless I can refill somewhere.

Drifted out of harbour on the ebb tide and picked up a light breeze from SE. outside, which I have held all morning and now, about 9.30 a.m., Boria Pagoda bears 100° and Talkeshwar 10°. I cannot get a suitable third bearing and accurate position is unnecessary.

11.30 a.m.: Wind light and variable since last entry, mostly due south, and I have made little progress. Now dead calm.

12.30 p.m.: Light breeze from SW. and am sailing on port tack with sheets well off for what I take to be Mirya Donghur coming above the horizon. I have finished my rod and have put out a spoon.

The tindal has been much interested in my preparations for fishing, looking on in sympathy and silent amusement. Been a "muchhi-wallah" himself he thinks a net much superior to rod and line. However, he is very tolerant of all my weaknesses.

I had several strikes to the spoon, evidently smallish fish, and after putting on a smaller spinner, hooked and landed a fish rather like a mullet which I do not know. It was only about 1½ or 2 lb., and as we were sailing fast, put up no fight, though it showed above water two or three times.

9.30 p.m.: The breeze from SW. freshened and backed to NW. We went bowling down to Mirya Donghur in great style with spinnaker sheet outside forestay, dropping anchor in Ratnagiri Bay at 5.30 p.m. The Bay is on the south side of the hill and affords excellent anchorage in prevailing

winds. The rocks in the middle of the bay show up at low water and can be avoided by keeping within two cables of the east shore below the fort and steering a course NW. I dropped anchor in $3\frac{1}{2}$ fathoms mud. After tidying up ship and bathing it was 6.30 p.m. and getting dark; being hungry I cooked dinner, pork and beans, boiled potatoes, tinned fruit, biscuits and cheese. My ice gave out this afternoon so I had a warm whisky and water. I made a mistake in not bringing soda. The warmth and the water are too much combined! Day's run $37\frac{1}{2}$ miles.

Nov. 21.—Slept until 6 a.m., and went ashore at 8.30. My dinghy was a canoe, locally called a tony. It was the smallest I have ever seen and was propelled by an equally diminutive chokra. After risking capsizing for some minutes I decided to sit as rigid as possible and leave balancing the abomination to the man (!) in control, which device succeeded in bringing us ashore in safety though I covered the seat of my choice white ducks with mud. I discovered this tragedy only when taking them off, so that my morning's happiness was undisturbed.

I ascertained from the customs "wallah" that there is a hospital, a Major I.M.S., and the ubiquitous Ford car. This was found in the village and most of the inhabitants helped to start it, but once going it went as a Ford will.

At the Hospital Major Kamat and his sub-assistant were most kind and procured me two dozen eggs for 12 annas. As all the baker's bread had been sold Major Kamat gave me a loaf of excellent bread and also filled my petrol tins with filtered water.

At the principal corner in this village is a shop which keeps most necessary things, e.g. lamps, wicks, glasses, pots, tinned foods, biscuits, etc. The inhabitants were most obliging and the village is pretty and interesting, with two historic forts built by the Mahratta kings. A good place to land and the first time I have been ashore since November 17.

Later.—Got up my anchor and put to sea on the first puff of breeze after the midday calm; course due south, close-hauled on the starboard tack, later easing sheets as the wind veered to the west.

4.15 p.m.: The breeze has been freshening all afternoon and I am approximately one mile NW. of Musargagi Point making for Viziadrug harbour. The cliffs of this Point are coal black and easily distinguishable from the sea.

Later.—Entering Viziadrug harbour B.S.N. Co.'s s.s. "Kamlavati" passed north bound. I steamed to Karwar in her last year. The entrance to Viziadrug has no difficulties and there is plenty of water right up to the landing stage in the river mouth SE. of the Fort. None of the fishing boats here showed riding lights. I anchored in 3 fathoms mud about $\frac{1}{2}$ cable from the bunder.

I bought here ten bottles of soda at nine annas each. The Customs official was again most useful, but there is only a very small fishing village and practically no supplies are available. Soda can be obtained almost

anywhere and though its purity cannot be vouched for, on such a cruise one must be satisfied if one placates the Goddess of Hygiene instead of satisfying all her demands.

The anchorage here is in a river and the water is muddy and unfit for swimming but the place is worth visiting, if only to see the old Fort joined to the mainland by a low sandy isthmus fringed with palm trees standing out against the sunset. The walls of the Fort are high and black and tower above the graceful spars of the country boats anchored in the harbour.

Nov. 22.—Days run 28 miles on the afternoon breeze. Up at 4.40 a.m. Breakfast, 4 boiled eggs, bread, butter and marmalade, and got the anchor at 5.45. As the first light airs of the morning breeze came out of the east we drifted down harbour and found outside, at dawn, a nice breeze coming from south-east. I aim at reaching Malwan to-day, but if the evening breeze holds I shall carry on to Vengurla.

8.25 a.m. : About $7\frac{1}{2}$ miles in 1 hour 20 minutes. There has been a nice breeze all morning but it is falling away earlier than usual.

9.15 a.m. : Dead calm.

4.30 p.m. : Through Karli Reef Passage and running with spinnaker set before a light NW. breeze for Vengurla.

The Karli Passage is a narrow opening through a reef of that name. It was formerly navigated by coastal steamers, since it provides a shorter route to Vengurla, but is now forbidden to large vessels since several have gone on the rocks.

The reef is several miles in length and is, for the greater part, submerged, only isolated rocks showing above the water. The passage is therefore not devoid of excitement when made in a small boat.

I was unable to locate the red buoy shown on the chart SW. of Chaldea Rocks and this increased the difficulty of the passage.

(Note—On my return journey I picked up this buoy and my inability to do so on the outward voyage was due to the fact that it had become whitened by seagulls and was indistinguishable at a distance from the white-capped waves.)

When Nuti Pt. bore 93° I laid a course towards it until Vengurla Rocks light bore 183° in accordance with the West of India Pilot.

My tindal was much impressed by my instrumental methods of finding my whereabouts. Had he known the possibilities of error he would have been even more impressed and perhaps as relieved as I was when the passage was successfully accomplished.

9.30 p.m. : I have just dined. Entering Vengurla there is a black buoy to be left to starboard, but we could not pick it up in the darkness so I fell back on compass bearings. As I jibed and altered course to NE. my tindal spotted the buoy about fifty yards to starboard. There is a good anchorage at the head of the bay under the fort in $2\frac{1}{2}$ fathoms, and I dropped anchor at 7.45 p.m. Then trouble began. After fifteen hours at the tiller I was

dog tired and while unshipping the rudder I let it slip. I hailed the tindal who was then hauling up the centre-board and in the excitement he let go, the purchase jumped the wheel and the gear jammed. I could just see what I took to be, either the end of the rudder or a cocoanut bobbing up occasionally in the dark and was about to go overboard after it when the tindal, with a paddle, swung "Osprey" round to it. With a sigh of relief I hauled it aboard. It is well to know that a Seabird rudder floats upside down with about two inches showing. Then began a shifting of gear, spare anchor, etc., to get up the floor boards and clear the centreboard purchase. Then dinner and now to bed. The run to-day was approximately $41\frac{1}{2}$ miles.

Nov. 23.—After a swim and breakfast the customs man came off to ask if he could do anything for me and kindly put me ashore.

Vengurla is a large clean and prosperous looking village where water and supplies can be obtained. After exchanging empty sodas for full ones I called on Dr. Goheen, in charge of the American Mission Hospital. He was very busy with a large out-patient clinic, but took me to his bungalow where I drank delicious coffee and cream and ate first-rate iced cake with his family. I was again out of bread (this is the only necessary supply difficult to obtain along the coast) and Mrs. Goheen very kindly gave me a loaf. Later the two little boys came down to see me off and we all went aboard the Indian Government vessel "Albatross" and called on Fletcher of the Salt and Excise. I got under way at 12.40 and hope to make Marmagoa harbour by 7.30 p.m.

3.20 p.m.: The breeze has freshened and we are reaching down the coast on the starboard tack.

4.45 p.m.: Aguada light bears 90°. 7 miles in 1 hour 25 minutes.

In Aguada Roads the breeze fell light and it was uncomfortable yawing about with a swell coming in from the SW. I eventually dropped anchor under Marmagoa Fort at 7.45 p.m. The sunset to-night was particularly beautiful, long high clouds lying over the western horizon, high cumulus towering above the hills to the east, all changing their colour in the light reflected from the sea. I dined at Spencer's Hotel, who put up an excellent dinner—the first meal for 6 days I have not cooked myself. There were more courses, but I cannot admit that the chef is superior to "Osprey's"! Moreover there was no ice and the verandah on which I dined was as hot as the inferno, without a breath of air and with a new petrol lamp making the place horrid with its noise and glare. This I caused to be replaced by a shaded oil lamp. Altogether I was glad to return to "Osprey" for a breath of fresh air and sleep at 10 p.m.

I had considerable difficulty in getting a very small and dirty tony to put me off and had to maintain a squatting position as there was nothing to sit on and I was wearing my going ashore clothes. To me the fascination of upsetting a tony is appalling. I have an almost uncontrollable desire to move suddenly and see whether the thing with the paddle will be quick

enough to counteract the upsetting influence. If not one imagines the horrible ending of going round and round for ever in a tony which, if it once started to revolve, would almost certainly continue to do so till the crack of doom.

To-day's run was approximately $28\frac{1}{2}$ miles on the afternoon breeze and, until it fell light in the evening, was the fastest we have made. From Vengurla to Aguada Pt., about 23 miles, took $4\frac{1}{4}$ hrs. There is no difficulty in making Marmagoa harbour at night and most supplies, including good bread, can be obtained.

Nov. 24.—I was wakened at 4 a.m. by a breeze from SE. and a slight loup in the harbour so breakfasted and got away at 4.45. The breeze carried me out of the Roads and at 7 a.m. Saint George's Islands were bearing 90° .

The breeze is now freshening, after falling calm for some time, and I am standing for Cape Ramas close hauled on the starboard tack.

10.15: A good breeze has held all morning, veering to south. I am now standing out to sea on port tack to get an offing for the sea breeze this afternoon and hope to run into Karwar under spinnaker if it comes well from the west.

3 p.m.: My reckoning shows me to be 15 miles off shore West of Canacona Peak. If the westerly breeze comes I should run into Karwar in 5 hours, but at present it is still coming steadily out of the south.

Nov. 25.—After sailing on the port tack for some time after the last entry, with a lumpy sea and a very wet boat, there was no sign of the southerly breeze dropping or shifting.

As there had been cloud and a peculiar haze all day, I decided that the weather had departed from the normal and went about for a beat to Karwar. Within a short time the breeze had headed me and was backing to SE. After two long boards with the breeze straight out of Karwar it backed due east for a short time and fell dead calm at about 5 p.m. At 5.30 a light breeze came again from SW. and I made a long board towards land but with sunset it fell dead calm again. It was a magnificent sunset with a dome of cloud over the west which seemed to shut in the light so that sea and sky became a glowing furnace.

A flat oily calm persisted until 11 p.m. and it was delightful lying in the moonlight with a light swell heaving us up and down, though unfortunately this prevented me from cooking any dinner.

Suddenly, during this calm, I heard heavy surf and leapt up with thoughts of currents setting me inshore but could see and hear nothing. There it was again, this time to seawards and again, in a few seconds, landwards. Then I saw a great dark shadow and realized the surf was caused by whales blowing, at least two and possibly more. I had visions of their resenting our intrusion on their element, or of their desiring to scratch themselves against "Osprey" and the disastrous consequences which might result. However, they gradually went in towards the bay south of Paidegal Point and though I heard them again at a distance they did not come unpleasantly near me again.

Shortly afterwards (I did not look at my clock which now keeps excellent time) a breeze came out of the east and I sailed for Karwar, standing well out past Lolien Head to avoid the rocks, then SE. for Ghoduli Peak and the red light on Karwar front.

As I know every rock in Sadashivgad Bay I dispensed with my compass and chart, almost to my undoing. I thought I was well eastward of Oyster Rocks when I suddenly saw what appeared to be another rock looming on my starboard bow and opening up from Karwar Head; then the shadow of two more to port. The moon had gone by now and in the dark it was impossible to reckon distance. I went about on the starboard tack and beat up the bay for some time. Then again stood south on the port tack but a sounding showed that I was getting into shoal water. I got out chart and compass and found I was north of Kurmagad Islands. The rock I had seen opening Karwar Head was the Island of Moger a Guda some 2 miles SE. of Oyster Rocks and not, as I had thought, one of them.

It had appeared to make these rocks and Shimis Guda and Kurmagad into one line although actually some miles apart. Had I not reverted to my chart I should have been on the sands which, at low water, almost connect Kurmagad with the mainland. This impressed upon me how very easy it is to go wrong at night without careful bearings, even in well known waters.

The breeze was strengthening and I had a nice reach across the Bay, dropping anchor at 4 a.m. where "Osprey" now lies about one cable in front of my bedroom window. I was very cold and wet having been at the tiller almost continuously for over 23 hours. Altogether it was a disappointing day. The morning breeze was the best I have had and I expected to reach Karwar by dinner time on the sea breeze. Its failure may be explained, possibly, by the cloud all day which prevented the land warming up. This would also account for the unusually long morning breeze.

To-day I hear that the Dagal or Five Finger Jack are in, and that my old friend Newlands, of Oyster Rock Lighthouse, has caught some big fellows. A good fighting fish is the Dagal.

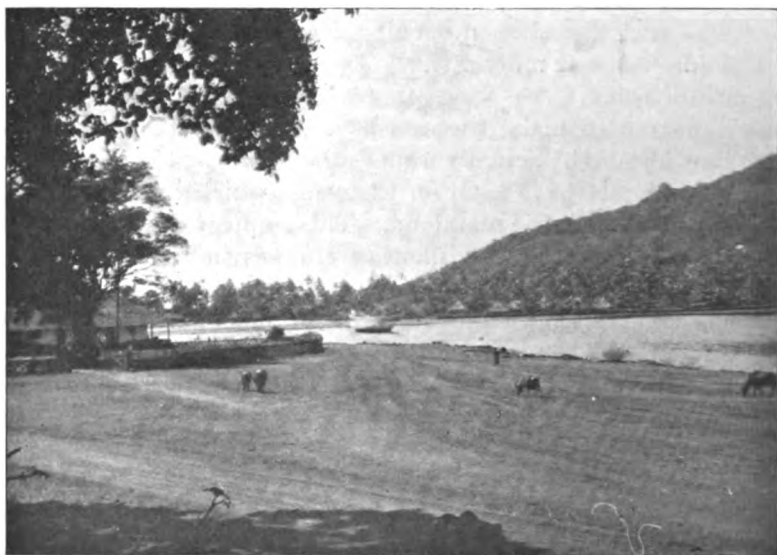
I spent to-day sleeping and getting all gear ashore and had a swim in the evening.

Karwar is even more beautiful than my impression of it last year led me to believe and compares not unfavourably with Rio de Janiero, which I have always considered the most beautiful harbour I have ever seen, though Karwar lacks the handsome buildings which adds so much to the beauty of the latter city when seen from the sea. It stands on the south-eastern shore of Sadashivgad Bay, which is seven miles across from north to south. The anchorage is in Bhatkul cove, a small re-entrant on the southern shore of the bay shut in by wooded hills on either side, and bounded by a sandy isthmus fringed with palm trees on the south. Across this Isthmus lies Bhatkul Bay, where the open blue sea rolls in on a beach of golden sand, and where perfect surf bathing may be enjoyed.

To the south and east of Sadashivgad Bay rise numerous peaks from Karwar Head to Daughish Peak, 1822 ft. in height, and wooded conical hills extend in a semicircle northwards to Lolien Point, a long low promontory which limits the Bay to the north.

Behind this semicircle of dark green hills rise the foothills of the Western Ghats, and further still the mighty Ghats themselves, shimmering blue and mysterious and beckoning always to the adventurous traveller.

Scattered about and beyond the harbour are many rocks and wooded islets, rising from the clear blue water to a height of 200 ft. or more, most prominent among them being Oyster Rocks and Kurmagad Island. The former is a wicked reef of scattered rocks running for over a mile east and



Karwar Cove.

west, a short distance north-west of Karwar Head, and terminating seawards in a wooded hill on which stands the lighthouse, tended for some 20 years by my old friend, Mr. Newlands—a mighty slayer of the denizens of the deep. I pity the luckless dagal or raus who seizes his shining spoon and sets his seven inch silex reel a singing.

Kurmagad and Shimis Guda Islands raise their heads close to the eastern shore of the bay at the entrance to the Kalinada River. The former has been fortified all round its circumference and within the old walls is a large well.

A mighty river is the Kalinada, winding amongst the foothills through tropical forests into the very heart of the Ghats themselves, over a mile wide inside the bar and navigable to country craft for many miles.

On its waters ply many craft bringing down the produce of the country.

and large rafts of teakwood, like floating islands, guided by men with long bamboo poles, come drifting down from the forests to the timber depot at the entrance to the river.

Beautiful as Karwar is by day it is incomparably so at dawn or sunset. In the early morning a light veil of mist hangs over the surrounding hills and as the first light of dawn comes over the mountains the Bay lies like a quivering opal in a setting surely made in Fairyland. Then the



Newlands of Oyster Rock Light.

first breaths of the morning breeze send the mists stretching out long fingers as though to seize this glittering jewel, but ere their purpose is accomplished the sun, rising above the towering Ghats, dissipates as if by magic these would-be despoilers of nature.

"Just as the day's first light comes pale and yet serene,
With strange unerring feet across the fields."

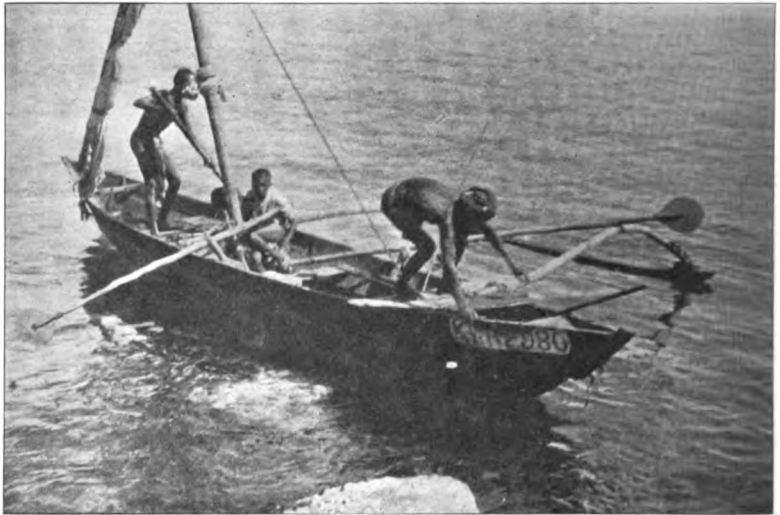
I sorrow for the unfortunate one who lies abed at such an hour and who does not know the loveliness and the beauty of the morning sea and sky.

Nov. 26.—The morning was spent in changing sails and rigging

"Osprey" for fishing. In the afternoon I tried an old mainsail, loose footed and with one reef down in order to bring the clew of the sail inboard.

This was done with a view to letting go the main sheet when a fish was hooked and having a clear boat as far forward as the main rigging from which to play the fish. As no fish was hooked the success or otherwise of this arrangement was not proved. The greatest disadvantage of a sailing boat lies in the fact that it cannot be taken close up to the rocks where very often the best fish lie.

I know of no more fascinating and soothing pursuit than sea fishing for the big game fish that swim on the surface and that take a spoon or natural bait trolled behind a boat. The fishing to be had on the West



My Fishing Catamaran.

Coast of India may not be comparable to that off Florida and Santa Catalina so vividly described by the master pen of Zane Grey in "Tales of Fishes," or that to be had off the Bay of Islands in New Zealand, but to one who has not been fortunate enough to experience the capture of these monsters of the deep, the sport which can be had here, when the fish are in, is altogether satisfying.

My fishing last year at Karwar was done entirely from a small catamaran rowed by four lusty Kanara fishermen, this being the only craft available, and on a tropical sea in such a craft some discomfort is inevitable. This is to some extent mitigated by a cushion, a large pith topee and dark glasses and is completely forgotten when the fish are taking.

The capture of large fish on rod and line is the most intensely exciting sport I know. The sudden strike of the fish; the moment of uncertainty while he lies, presumably wondering what strange glittering thing he has

taken ; the driving home of the hook and the sudden realization on the part of the fish that all is not well, are crowded into a few seconds of rapid action.

Then comes the music of the reel as he makes his first mad rush, steadied by careful application of the brake, while the coloured wool shows perhaps 150 yards of line has been taken off, followed by wild leaps in the air in strenuous endeavour to throw the hook or break the slender line by a powerful blow of his tail. This, to my mind, is incomparably more thrilling, the delicate handling of the fish on light tackle infinitely more artistic and satisfying, than the stalking of an animal and the killing of it by a single shot. And only now the real struggle begins. Line is recovered inch by inch, foot by foot, only to be taken again by the fish. If he has not shown himself, what size is he? Again and again he changes his tactics, now going off like a torpedo in a flurry of foam, the line hissing through the water, the reel screaming its song ; now sounding in the depths with ponderous jerks or striking the trace heavy blows with his tail, always a dangerous move ; now leaping in the air a silver streak, the spray flashing in the sunlight.

Gradually his rushes became shorter, his tugs and jolts less forceful until, fighting all the way, he is gently brought alongside the boat. Then a hand is put out with the gaff ready. He sees it, and bang ! away he goes again, a last despairing rush almost as terrific as his first and one to be prepared for, or he is lost. At length, after an hour or more of tense excitement, he is again brought alongside exhausted, lying on his side an easy victim for the gaff. Carefully he is lifted into the boat a quivering shining thing of beauty built for power and speed, dark green and blue above with shining silver sides and snow-white belly, every scale glittering and opalescent in the sunlight.

With what a sigh of satisfaction do we sit down and gaze upon him, calculating his weight and lighting the much-needed fragrant weed before renewing the steel wire trace and putting out the spoon again. For even steel wire is not proof against such a battle, and the smallest kink may mean the next fish lost. A man must be hard, fit to continue long at such a game, hands hardened and muscles of back and arms in good condition.

Nov. 27.—This afternoon last year's method of fishing from a catamaran was tried in order to allow my tindal a day of rest. An excellent crew was secured and many favourite places which last year yielded good fish were tried with never a strike. The fishermen say that the strong off-shore breezes which are blowing almost continuously have driven the big fish out to sea, but there is much cloud, and some atmospheric disturbance is the more likely cause. It was strange how quickly one fell back into the old " tony " ways. The naked brown bodies of the crew, the heaving swish of the outrigger as it plunges through the waves and the cry of the helmsman urging the crew to greater efforts, came back to one as though from yesterday. Even the smell of the " tony " seemed still familiar !

This is not a method of fishing to be recommended when the fish are uncertain and the discomfort is not compensated for by good sport, unless the fishing ground is near and one can go out for two or three hours in the early morning or the evening, or unless there is some friendly shady island where one may land and rest when fish are off the feed and the sun grows hot. One must also train one's crew to keep the outrigger away from the line when a fish is being run.

How often one is asked, "But is not fishing very wearisome when the fish do not take?" Can a thing which is ever changing, which rarely presents the same face for an hour at a time, and which is always and above all things supremely beautiful, be wearisome?

There is not only the sea and the sky. There are the distant hills with their changing lights and shadows, the fresh air which, after a year of jaded city life, one breathes deep into one's lungs, the puffs of wind that come and go upon the surface of the water.

"A wind of night, shy as the young hare,
That steals e'en now out of the corn to play,
Stirs the pale river once and creeps away."

There are also the things that live on and in the sea and in the air.

Country boats with their tall sloping spars and winglike high-peaked sails come up out of the horizon and slowly drift down again seawards, sailing upon the very edge of the world, or turn landwards to some hidden river port amongst the hills for new cargoes.

A steamer appears, a smudgy blot of smoke on one horizon, quickly becomes a live pulsating thing of energy and as quickly disappears again beyond where sky meets sea.

There are the gulls which circle the boat, continuously flirting with the waves and plunging ever into the water in their eternal search for food. How gracefully they twist and turn, and when one catches a fish with what chattering the others set upon him. See him drop his prize the more easily to dodge the others, catching it again like a flash when the rest have wheeled past him. Then two great white sea eagles appear from their eyrie in the distant hills, floating majestically, silently, with scarce a movement of their outstretched wings. Soon, near at hand, a shoal of small fish breaks the surface, hunted by their enemies below, and down an eagle comes with terrific speed, graceful and awe inspiring, to seize one in its talons and carry it away to be devoured at leisure in the heights above. Their method of seizing their prey is less certain than that of the gull, who, after a plunge, rarely emerges without a silvery prize in his beak, whereas the eagle sometimes strikes many times before capturing a victim. Possibly his greater size makes him less quick to follow the rapid movements of the fish.

I have seen a sea like an expanse of clear blue glass rippled here and there upon the surface by shoals of small fish each perhaps half an acre in

extent. Quite suddenly, with a sound of rushing water, a shoal will leap upwards only to fall back again, and immediately large fish can be seen cutting through them, leaping, slashing, killing. A pause when all is quiet—then back they come again. If the killers are a shoal of surmai, then indeed it is a sight worth seeing. These large fish throw themselves repeatedly several feet out of the water, leaping, rushing, splashing, until the whole sea becomes a seething turmoil. And so the battle is waged continuously between sea and sea, and sea and air, and air and air, never for one moment without expectancy, rarely without interest and always amidst the greatest beauty.

Nov. 28.—As there was a nice breeze from the north-east I went for a sail about midday, and later put out a spoon when the breeze fell lighter. In accordance with local advice I went about nine miles out to sea and had one small strike—then later hooked and lost a small surmai on a large spoon. I changed the spoon for a small silver spinner and hooked a bigger fish which gave me a good run and which, when alongside the boat, proved to be a raus of 10 or 12 lb. He was well hooked in the corner of the mouth and lying on his side. I admired him for a few moments and then showed him the gaff. Down he went in the usual manner of this game fish, taking 30 yards of line before the rod straightened and the line came slack. I had treated him gently, but found that my steel wire trace had broken, evidently a spot of rust or a kink. However I had the sport of running him and was contented, so sailed home to bath and dinner and an hour with Mr. Jorrocks, M.F.H.

To-day I employed a different and better method of handling the boat when running this fish. They usually take best when the sea is not too rough and with the reefed mainsail one does not get enough speed in light breezes. I used a full mainsail with the boom and instructed the tindal to luff, let go the sheets and top the boom right up when I hooked a fish; then to overhaul the main sheet and get it out of the way. This worked most satisfactorily but one drifts rapidly and must have a good offing. Moreover, with a heavy fish, the drifting would tell decidedly against the man and the rod and in favour of the fish.

In spite of possibly fewer fish it is so much more enjoyable fishing from the yacht than from a catamaran that one feels justified in sacrificing a little sport, particularly as few fish are in at present, and one has the interest of sailing to fall back upon.

(To be continued.)

Editorial.

REPORT OF THE LISTER INSTITUTE OF PREVENTIVE MEDICINE.

THE Governing Body presented the Institute's Forty-third Annual Report on June 3, 1937.

The first subject dealt with under the heading of Research Work is the study on viruses. During the year studies on various aspects of the virus problem have been continued by workers in the Department of Bacteriology, Serology and Experimental Pathology.

Dr. M. H. Salaman has continued his investigation into the antigenic structure of the vaccinia virus. He has compared the serological properties of the elementary bodies with those of the soluble antigen of the virus which can pass through filters that retain the bodies. It has emerged that the virus neutralizing power of an anti-vaccinal serum can be removed by absorption with a sufficient dose of washed elementary bodies, but not by absorption even with large doses of the soluble antigen. On the other hand, precipitins and agglutinins can be absorbed from such serum in varying degrees by the bodies and by the soluble antigen.

Dr. G. H. Eagles, with the assistance of other workers, has continued the study of a possible virus agent in the causation of acute rheumatism, rheumatoid arthritis and chorea.

The inquiry has been conducted on three main lines: (1) Specific agglutination tests with the sera of patients; (2) infection experiments in monkeys; (3) electrocardiographic investigation of sick animals that appeared to react to experimental inoculations. Suspensions of elementary bodies recovered from rheumatic exudates (pericardial, pleural, and joint), joint fluids and synovial membrane from rheumatoid arthritis and in a few instances from the spinal fluid in chorea have been agglutinated by sera from homologous cases. Evidence of cross agglutination within the rheumatic group suggests that these diseases have in all probability a common ætiological factor. Concomitant infection by streptococci probably plays a part, and the interaction of these with the agglutination reaction has been studied throughout the clinical course of the disease in a series of 200 cases. Infection experiments with monkeys have not so far given unquestioned confirmation of serological findings.

As regards the use of the electrocardiograph in diagnosing the nature of cardiac involvement of monkeys. A complicating factor is that little is known of the simian electrocardiogram either in health or disease. Experiments are under way to discover, if possible, the determining factors in the causation of the prolongation, in monkeys, of the P-R interval.

which is considered to a large extent pathognomonic of early rheumatic carditis in the human subject.

Under the heading of serology, studies on the "Vi" antigen of *S. typhi* are described by Dr. Felix. His earlier conclusion that only strains containing both the "O" and the "Vi" antigens possess the highest degree of virulence of which *S. typhi* is capable, is confirmed by recent investigations. A variant has been described which in all respects behaved like a typical rough variant and was avirulent although it contained "Vi" antigen. From a culture of this strain, which Dr. Petrie had kept for ten months in horse serum containing both "O" and "Vi" antibodies, another variant was isolated, which, though devoid of "O" antigen, otherwise resembled the smooth type. Growth on agar plates and in broth showed the characteristics of smoothness and suspensions of this variant were not agglutinated by salt solutions up to 5 per cent or by heating to 100° C. The virulence for mice was of the same low order as the "O", agglutinable, smooth type, which is devoid of "Vi" antigen.

As regards physico-chemical properties the "Vi" antigen contained in smooth typhoid bacilli appears to differ from that in the "rough" typhoid bacilli. Suspensions of smooth "Vi" strains heated at 100° C. are no longer agglutinable by "Vi" antibody, while similarly treated suspensions of a rough "Vi" strain are still agglutinated. Treatment with 75 per cent alcohol also has different effects on the "V" agglutinability of the two varieties of "Vi" strain—the agglutinability of the smooth variants is much reduced, practically annulled, whereas that of the rough variant is not impaired. On the other hand the two variants do not differ with regard to the effects of heat or alcohol on their capacities of absorbing the "Vi" antibody or stimulating its formation.

In view of these findings the resistance to chemical treatment of the "Vi" antigen contained in "smooth" and "rough" variants was carefully investigated. Suspensions exposed to the action of HCl, NaOH, phenol and formalin did not show any difference in the two variants as regards agglutinability, absorbing power, and capacity of inducing the formation of circulating antibody. It would appear that the physico-chemical behaviour of an antigenic substance may vary as the result of the presence or absence of some other substance, which itself may be either antigenic or non-antigenic in nature. It is considered that the difference noted in earlier experiments between the effects of alcohol on the "Vi" antigens of *S. paratyphi* A and B, and *S. Aertrycke*, on the one hand, and the "Vi" antigen of *S. typhi* on the other hand, is of no greater significance than that now established for the "Vi" antigen contained in "smooth" and "rough" typhoid bacilli.

Experiments with antityphoid vaccine have not yet enabled a vaccine to be prepared in which the "Vi" antigen is preserved in its most effective form. From Dr. Schütze's experiments it appears that active protection

experiments with mice do not disclose those great differences in the antigenic value of various preparations of the "Vi" antigen which are clearly demonstrated by passive protection experiments or by *in vitro* tests.

Dr. Felix, in co-operation with Dr. W. D. Nicol, has tested the antibody response in fifty persons who had been given three doses of an alcohol-killed typhoid vaccine by the subcutaneous route. A marked increase in the "O" antibody was observed in 100 per cent of those inoculated, and a significant increase of the "Vi" antibody in 50 per cent. After storage for half a year, however, it was found that the vaccines had lost the power of stimulating the formation "Vi" antibody in the rabbit.

Dr. Felix has been working on the possible value of "Vi" agglutination in the detection of typhoid carriers. Sera from forty-five typhoid carriers have been examined, and the results obtained suggest that "Vi" agglutination seems to have a strong claim to a definite place in the routine diagnosis of typhoid carriers. It is noted that all the twenty-five strains from chronic typhoid carriers examined were found to contain "Vi" antigen.

The antigens of *B. pestis* have been investigated by Dr. Schütze; his early work showed the importance of the envelope component in prophylactic inoculation of rats. Similar work performed on mice at the Haffkine Institute, Bombay, has given divergent results and Dr. Schütze is now undertaking a comparison of the two types of immunity as developed in the mouse and in the rat. As investigations at Bandoeng, Dutch East Indies, have shown that living avirulent plague inoculations produce excellent immunity, but only when the organism is in what is considered to be the smooth state, Dr. Schütze is including the so-called rough and smooth variants in his analysis.

Modifications in the technique of the Chick-Martin test for disinfectants have been suggested as a result of experiments carried out for a sub-committee of the British Standards Institution concerned with the standardization of the methods for the testing of disinfectants. The most important modification suggested is the substitution of dried yeast for dried faeces as the organic matter of the test. This was first suggested in 1934, by Dr. Garrod, a member of the committee, and has been found of considerable value.

In order to obtain concordant results special attention has been paid not only to the method of maintaining the stock culture, but also to the medium on which it is grown for the test.

A much criticized point in the technique has been the addition of the disinfectant to the organic matter before the culture. It has been stated that the phenol coefficients so obtained would be lower than if the organic matter and culture were added to the disinfectant together. This criticism has not been supported by experimental data. Tests have shown that the organic matter and the disinfectant may be well mixed together and left

in contact for at least four hours without any lowering of the phenol coefficient.

Work on the vitamin-B complex has been carried out by Dr. Macrae and Miss Edgar, who have shown that aqueous yeast extracts contain two factors in addition to B₁ and flavin necessary for the growth of rats. One of these factors is removed with flavin from this yeast extract by absorption in fullers' earth in acid solution, while the other remains in the fullers' earth filtrate and can be eluted with barium hydroxide.

The establishment of these two factors in addition to B₁ and flavin will help to clarify the position of the vitamins in the B group.

Dr. Macrae and Miss Edgar have been engaged during the year on the chemistry and purification of the factor not absorbed by fuller's earth. The results suggest that this vitamin may be distinct from B₆, as described by György.

Miss E. M. Hume and Miss Henderson Smith have been studying a dietary deficiency in rats which affects their breeding capacity, the full-term young dying *in utero* or failing to survive after they are born. Such young as survived last year showed skin lesions characteristic of the lack of the unsaturated fatty acid (linoleic acid). This year, by the addition of linseed oil the skin lesions have been corrected, but the other features of the syndrome have only been partially improved, and it is thought these symptoms might be due to a partial deficiency of vitamin E which when totally lacking causes resorptive gestations in the female. The effect of the addition to the diet of an unsaponifiable fraction of wheat germ oil is now being tested.

Dr. S. S. Zilva working on the vitamin-C requirements of the guinea-pig has compared the vitamin-C content of selective organs with the intake of ascorbic acid. He found that to attain the maximum concentration in the tissues, ten times the protective dose had to be given. But guinea-pigs which contained only minimal amounts of vitamin C in their tissues lived for a number of years and attained very high weights. Furthermore, the time taken to succumb to scurvy when placed on a scorbutic diet was not appreciably different whether the tissues carried their maximum load of ascorbic acid or only traces of it when the scurvy diet was commenced. The accumulated vitamin C in the body of the guinea-pig does not act as a store in the true sense of the word. The results of this investigation lend support to the view expressed by Dr. Zilva and Dr. S. W. Johnson, from general observation on human beings, that there is a wide margin of unsaturation with vitamin C which has no obvious detrimental effect on the health of the individual.

A collective investigation has been organized by Miss Hume as Secretary of the vitamin-A sub-committee to compare the results of biological and spectrographic estimations of vitamin A. The aim was to obtain trustworthy figures for the conversion factor required for relation of the results of the biological and spectrographic tests and expression of this in International Units. Ten different laboratories participated in the tests and the

results showed a satisfactory degree of concordance and gave no support to any alteration of the value 1,600 adopted for the conversion factor at the 1934 International League of Nations Vitamin Standardization Conference. Discrepancy observed in the case of some estimations was found to be due to instability of the material during the period of the biological test and this suggested that other vitamin-A concentrates might behave in a similar manner. Further work is contemplated on these lines with a view to explaining other reported discrepancies. If these cannot be satisfactorily resolved there is a possibility that the spectrographic method may have to be abandoned and vitamin-A standardization made to depend on the biological test alone.

Dr. H. Chick has collaborated with Dr. Birch and Sir Charles Martin in an experimental investigation of the nutritive defects of maize in the hope of throwing light on the ætiology of pellagra as it occurs among populations which consume maize as staple cereal. The experimental animals were pigs which were given a diet containing over 80 per cent of ground whole white maize supplemented with peameal and a small amount of purified casein to increase the protein content, extra salts, and cod-liver oil. Dogs on this diet develop a disorder known as nutritional black tongue, which is held by many to be the analogue of human pellagra. After about six weeks on this diet the young pigs ceased to grow, showed loss of weight, anæmia, and severe diarrhœa and died unless the diet was changed. They showed no skin sensitisation to sunlight. The disease was prevented by the addition of 4 per cent yeast in the diet, or if the maize was replaced by a mixture of wheat and barley. The disease was cured in a dramatic manner when yeast or an autoclaved protein-free yeast was added to the diet. These facts pointed to a deficiency in maize of some heat-stable constituent in the yeast extract, e.g. some constituent of vitamin B₂. Preliminary tests with flavin gave negative results.

An investigation of wheat and bread was begun by Dr. Roscoe in 1935, and has been continued by Miss Copping. Samples of whole wheat flour and straight run white flour, as commonly used for bread making in this country, were provided by Messrs. Chitty and from these flours breads of standard composition were baked under controlled conditions in the experimental bakery of Dr. Kent-Jones.

The wholemeal flour and the white flour, both unbleached and after bleaching, and the yeast used in the baking of the bread were investigated by means of growth tests on rats for their content of vitamin B₁ and B₂ and by separate tests for that of flavin and other constituents of the vitamin-B complex and the results compared with those obtained from equivalent amounts of baked bread. The vitamin B₁ and B₂ contents of the wholemeal flour and bread were much greater than those of the white flour and bread. These latter, however, proved unexpectedly rich in vitamin B₁ and

the amount in the bread was not to be attributed to the added yeast, seeing that the values for the bread and the flour were equivalent. Control experiments with ground polished rice, in which the rats developed characteristic nervous symptoms of B₁ deficiency emphasized the difference between polished rice and white flour in this respect and afforded an explanation of the rare occurrence of beri-beri on one-sided diets which contain wheat as the staple cereal.

The content of flavin was low in both types of flour and breads, the white flour and bread being definitely inferior to the wholemeal. The second constituent of the vitamin-B₂ complex (the so-called vitamin B₆) was abundantly present in the wholemeal flour and bread and less so in white flour and bread. The nutritive value of wheat flour and bread would appear to be limited by their low content of flavin.



Clinical and other Notes.

A CASE OF CARCINOMA OF THE COLON.

BY MAJOR K. FLETCHER-BARRETT,
Royal Army Medical Corps.

THE following case is published on account of its rarity in a patient aged 25. I do not propose giving all the pre- and post-operative treatment, etc., as I think the essentials only will be of general interest.

Briefly the facts are: Trooper L., aged 25, was admitted to hospital on November 1, 1936, as a case of acute appendicitis. When seen by me, he was complaining of pain in the right iliac fossa. Temperature 98° F., pulse 96. The abdomen moved well on respiration, there was no rigidity. There was tenderness over the whole of the right half of the abdomen, not localized to any particular spot. No hyperæsthesia, nothing abnormal was felt per rectum. White blood-cells 10,625. He was treated in the Fowler position, given water by mouth and a turpentine enema.

He improved somewhat during the next six days, and his diet was gradually increased, but he ran an evening temperature of 99° F. On November 7 he became constipated for the first time and vomited. At that time he was thought to be one of the enteric group of fevers; however, by November 14, blood cultures, urine, stools and Widal had all proved negative to the enteric group. By this time he had become slightly distended, although his bowels were regulated by enemata. On November 15, he had an acute attack of pain, the distension was more marked, as also was tenderness. Visible peristalsis was present. I decided upon a laparotomy.

On November 16, under spinal stovaine and ether anæsthesia, I opened the abdomen by a paramedian incision. I found that there was a stricture of the large intestine in the region of the hepatic flexure, with some, though not marked, distension of the intestines proximal to this. I performed a cæcostomy through a separate incision, inserted a Paul's tube and closed the abdomen.

On November 19 he developed bronchitis—this had cleared up by November 24, his temperature, pulse and respirations then being 98·4° F., 80 and 24 respectively. On November 30, he developed a small thrombosis of the right popliteal vein.

His condition gradually improved until December 16, when I decided that he was fit enough for further operation. Again under spinal stovaine and ether I reopened the abdomen through the original laparotomy incision. I removed the last six inches of the ileum, the whole of the ascending colon, including the growth, and about three and a half inches of the transverse colon. A tube was sewn into the rectum; the cæcostomy and laparotomy wounds were closed.

On December 17 his general condition was fairly good considering the extent of the operation, but there were a few moist râles in both lungs. Temperature 102° F., pulse 138, respiration 44.

On December 19 he passed fæces per rectum. By December 21 he had improved considerably—temperature 99·8° F., pulse 112, respiration 32, though there was slight purulent discharge from the cæcostomy wound and the lower end of the paramedian incision. On December 22 the rectal tube was removed, as it was causing considerable irritation.

On December 29, without previous pain or other signs, he developed a fæcal fistula through the cæcostomy wound.

On December 31 he had a sudden pain in the left axillary region. On examination, there was diminished resonance with tubular breathing. Temperature 101° F., pulse 108, respirations 48. There was very much less discharge from the cæcostomy wound, and none from the laparotomy one.

From now onwards there was slight muco-purulent sputum until January 10, 1937, when there was rapid onset of expectoration of very foul sputum. The cæcostomy wound was much smaller and solid fæcal results were being obtained by enemata. Temperature 98·4° F., pulse 116, respirations 30. By January 24, despite all forms of treatment, the foul sputum had increased to about a pint daily, this, on standing separated into layers, similar to that of a case of bronchiectasis.

On January 27 he had extreme tenderness over the right sacroiliac joint, but I was unable to find any local signs beyond this. From now on until February 10, he had various ups and downs, but his general condition deteriorated rapidly. He became unconscious and died on February 12. Post-mortem examination was refused.

The pathological report on the growth was "Adeno-Carcinoma with commencing mucoid degeneration. No obvious involvement of glands. Section of glands show no cancer cells."

DISCUSSION.

(1) A case of carcinoma of the hepatic flexure of the colon, in a young soldier, aged 25, is described.

(2) I presume that the vein, chest and joint conditions, together with the development of a fæcal fistula, were manifestations of a septicæmia.

(3) The anastomosis between the small intestine and the transverse colon would appear to have held, as the fæcal fistula did not develop until thirteen days after operation. Moreover, fæces were passed after enemata and normally subsequent to this development.

(4) Death appears to have been due to the lung condition, secondary to septicæmia.

(5) It is very unfortunate to lose such a case, which, for the few days immediately after operation, appeared to be doing so well; although I feel

that, in a man of this age, one must regard the prognosis as grave in any case.

I am indebted to Colonel W. F. M. Loughnan, M.C., Commanding British Military Hospital, Lucknow, for permission to send this case for publication.

A CASE OF SELF-HEALING TYPHOID PERFORATION OF THE ILEUM.

BY CAPTAIN H. N. PERKINS,
Royal Army Medical Corps.

PRIVATE F. S., aged 26, reported sick on October 2, 1936, with a history of malaise and headache for four days. He had recently returned from a Vocational Training Course at Poona and on the train journey had purchased several cups of tea from hawkers.

On examination his temperature was 100° F. with no definite clinical signs. The next evening his temperature rose to 102° F., the pulse-rate remaining at 100. There was no leucopænia.

On October 5 the morning temperature was 102° F., the pulse-rate 100; a blood-count showed a definite leucopænia. The tip of the spleen became palpable, and the condition was diagnosed clinically as belonging to the enteric group of fevers, and treatment on standard lines was instituted.

The case proceeded normally, scattered rose spots appearing in the epigastric region on October 8 (estimated to be the tenth day of disease) and the temperature rose to its maximum of 104.4° F., whilst the pulse slowed to 80 beats per minute. On this day, the first Widal reaction result was returned showing an agglutination to *B. typhosus* of $\frac{1}{17}$. Two days later the blood culture taken on the sixth day of the disease showed *B. typhosus*.

On the morning of the thirteenth day the patient complained of slight abdominal discomfort; this persisted for some twenty-four hours, when a small degree of tumidity of the abdomen became apparent on palpation. On the fifteenth day he experienced severe abdominal pain localized to the right iliac fossa and vomited twice. These symptoms rapidly cleared up although some rigidity persisted for four hours. Arrangements were made to perform a laparotomy, diagnosis of a typhoid perforation having been made, but improvement was so rapid and the physical signs were so transient that an expectant course was adopted.

Acute generalized abdominal distension of a paralytic type appeared on the seventeenth day, consistent with typhoid meteorism. This was treated with pituitrin in small doses with excellent effect; the distension subsided and the bowels again acted normally. His general condition improved vastly. However, on the twentieth day of the disease, he brought up some tenacious sputum, and there was evidence of definite pulmonary consolidation at both bases. Treatment for bronchopneumonia was instituted and the sputum became less tenacious.

Two days later, in the evening, the patient experienced a rigor lasting two minutes, followed by a sudden agonizing pain in the præcordium. On examination of the chest, a definite area of dullness to percussion, with no air entry, was found extending from the cardiac dullness to the 4th to 7th interspaces in the mid-axillary line. A diagnosis of small pulmonary embolus was, therefore, made on these findings.

Next day (estimated twenty-third day of disease) a definite broncho-pneumonia had set in, with patchy consolidation of both lungs, the sputum becoming rusty and then purulent. The general physical state showed much more deterioration and it was felt that, in addition to the picture described above, a relapse of his intestinal typhoid condition was occurring. The cardiac rhythm next showed some irregularity, but there was good response to digitalin. Oxygen had been given intermittently for the last three days with excellent effect, and by evening the cardiac respiratory mechanism was showing marked improvement.

Early in the morning of the twenty-fifth day he became irrational and tried to get out of bed, complained of some hypogastric pain and was incontinent of fæces. Abdominal distension again became prominent, but was relieved by pituitrin in minimal doses. The pulse-rate began to mount and the heart's action again became weaker, responding once more, however, to digitalin. There was incontinence of urine.

On the following day there was incontinence of both urine and fæces, and in the fæcal material there was a trace of blood; this was quickly followed by a brisk hæmorrhage at the next passage of fæces; horse serum and calcium intravenously, together with morphia, were given, and controlled the bleeding. He died next evening (twenty-seventh day).

Post-mortem Findings.—The following are extracts from notes made at the post-mortem examination carried out by the author of these notes.

Small intestine: The duodenum was normal, as was the jejunum in its upper half, the lower half was somewhat congested. In the ileum, multiple typhoid ulcers were seen lying in the length of the lumen of the gut, and varying in size from one quarter to half an inch in diameter; mostly healed or healing. The gut was thinned in its terminal twelve inches to a marked degree. Two inches from the ileo-cæcal valve there was an ulcer one quarter of an inch in diameter, whose base had perforated, but the great omentum was wrapped around it and firmly adherent, thus preventing any leak into the general peritoneal cavity.

Large intestine: Almost one pint of mixed recent blood and food material was recovered from the right para-cæcal gutter, tracking towards the pelvis. In the cæcum, two inches from the ileo-cæcal valve, and one quarter of an inch internal to the anterior tinea coli, was a large very recent perforation, with blood adherent to it: size 1 by 1½ inch, with some local thinning of the cæcal wall. The ascending colon was congested, the rest normal.

The liver was enlarged, the cut surface appeared fatty with obliteration

of the liver pattern. The gall-bladder contained two ounces of straw-coloured bile; there were no calculi; the mucosa showed some pin-point hæmorrhages; bile duct was patent.

The spleen was moderately enlarged and very soft in consistence, red in colour; the cut surface was very soft and of "strawberry jam" appearance. Weight eight ounces.

Respiratory system: There were hæmorrhagic patches over the lower third of each lung, with some scattered ones at other areas. There were adhesions at the left apex, and slight emphysema at the right apex: On palpation, the lungs felt heavier and more resistant than normal. They were crepitant in bulk. The cut surfaces showed the lower halves of both lungs to be red to purple in colour, the bronchioles containing some purulent material. The upper areas were less involved, but definite areas existed. The left mid zone showed some organizing blood clot and areas of collapse.

Comments on the Case.—The chief point of interest in this case is the demonstration, post mortem, of the successful role of the great omentum in combating an acute abdominal condition. This is comparable to the common experience in the surgery of the acute abdomen, when the omentum is discovered at operation to be wrapped round the appendix, thus preventing a general peritonitis.

The number of complications occurring in this one case of typhoid fever must be somewhat unusual.

I have to thank Lieutenant-Colonel E. Phillips, D.S.O., M.C., M.B., R.A.M.C., Commanding British Military Hospital, Jhansi, and Colonel S. G. S. Haughton, C.I.E., O.B.E., M.D., Assistant Director of Medical Services, Meerut District, and Delhi Independent Brigade Area, Eastern Command, India, for their permission to send these notes for publication.

Echoes of the Past.

WAR EXPERIENCES OF A TERRITORIAL MEDICAL OFFICER.

BY MAJOR-GENERAL SIR RICHARD LUCE, K.C.M.G., C.B., M.B., F.R.C.S.

(Continued from page 134.)

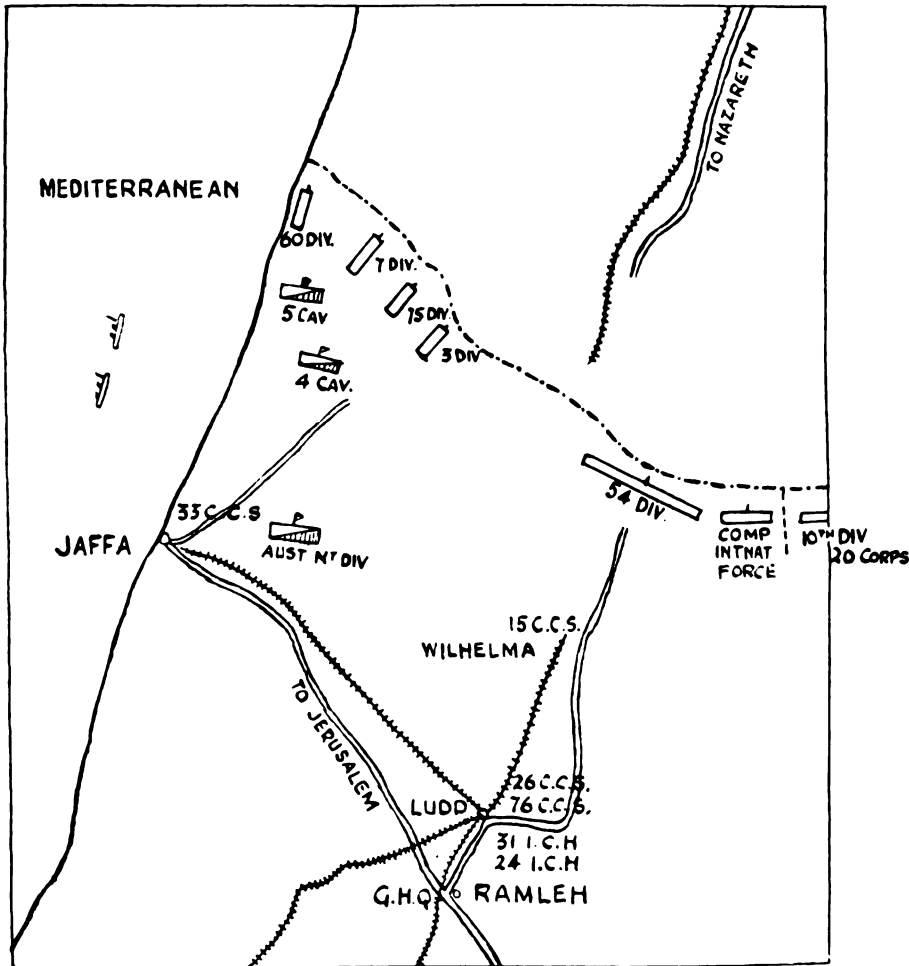
CHAPTER XXVII.—THE GREAT ADVANCE.

It is not necessary to give more than an outline of the scheme for the great attack of the 21st and the Desert Mounted Corps on the Turkish lines on September 19. The four divisions of the 21st Corps were strengthened by the addition of the 60th Division from the 20th Corps and by the French Contingent.

The attack was entrusted to Lieutenant-General Sir Edward Bulfin commanding the 21st Corps. The whole corps was massed across the

Plain of Sharon in the following order from right to left: French Contingent, 54th Division, 3rd Division, 75th Division, 7th Division, 60th Division. Three of the four divisions of the Desert Mounted Corps, under Lieutenant-General Sir Harry Chauvel, were secretly assembled

POSITION OF 21ST CORPS, SEPTEMBER 18, 1918.



and carefully hidden in the forest of orange groves around Ludd and Jaffa, behind the left flank of the 21st Corps.

The defence of the Jordan Valley was entrusted to Major-General Sir Edward Chaytor, commanding the Anzac Mounted Division, who had under his command in addition to his own division a brigade of Imperial Service Indian Infantry and a composite brigade of Jews and British West Indians, a sufficiently curious combination.

The plan of operation was, after a hurricane bombardment from the twenty batteries of artillery at dawn, to attack along the whole line. Once the Turks were driven out of their positions the three left divisions were to break through and advance rapidly, with the 60th, on the coast, leading, so as to head off the retreating Turks from the sea and leave a gap. In this they were to be assisted by a flank fire from two torpedo-boat destroyers. The whole body of cavalry would then push through the gap past the left flank of the 60th Division, riding on straight northwards until they had passed the main body of the retreating Turks. Then they would turn inland and cross the Mount Carmel range, which shuts off the plain of Sharon from the Plain of Esdraelon, by a westerly pass. They were to cut the railway at Afule which is the junction where the Turkish line from Ludd joined the Haifa-Damascus railway, and after sending a detachment to seize Nazareth, the Turkish Army Headquarters, were to await the arrival of the retreating Turks and cut them off as they debouched into the plain. Their route of retreat would be by a more easterly pass at Jenin through which the railway and the strategic road forming the Turkish Line of Communication crosses the mountains. Part of the cavalry at the same time was to push on eastwards up the Plain of Esdraelon, past Samaria and Nablus, in order to prevent the Turks from retreating down into the Jordan Valley along the railway towards Beisan.

The attack by the 20th Corps, under Sir Philip Chetwode, in the Judæan hills was, as has already been mentioned, to be withheld until the successful result of the 21st Corps attack was assured.

The medical arrangements for the operation involved no great change in the disposition of hospital units. No. 15 Casualty Clearing Hospital was held in readiness but not opened until the morning of the 19th after the battle was commenced. It was placed at Wilhelma on the railway line about ten miles north of Ludd, almost the furthest point to which the railway had then reached. No. 33 Combined Casualty Clearing Hospital was at Jaffa, about ten miles behind the left flank of our old line. These two units were to receive all the casualties in the first instance from the field ambulances and pass them on by train and motor ambulance to the four clearing hospitals at Ludd.

Jaffa was connected with Ludd at this time by a light Decauville railway only, the Turks having removed the rails of the Jaffa-Jerusalem railway between these places and used them elsewhere. The rolling stock on the Decauville railway consisted of open trucks and was only suitable for the evacuation of sick or lightly wounded. All serious cases had to be brought the nine miles in motor ambulances by road. There was a good railway siding up to the clearing hospitals at Ludd which enabled the hospital trains to be loaded from them rapidly. The railway from Ludd to Jerusalem was available for hospital trains and brought down casualties collected in the Jerusalem clearing hospitals from the 20th Corps front and from the Jordan Valley.

All the details of the scheme for medical evacuation from the front in this operation had been most carefully and skilfully worked out by Col. E. P. Sewell, D.D.M.S. of the 21st Corps.

During the operations the weather remained fine so that the roads North which were merely earth tracks were good going for motor ambulances at this time.

We were all awakened at 4.30 a.m. on the morning of the 19th by the sound of the furious bombardment. Early in the forenoon news came through of the success of the attack and that this had been obtained without very heavy losses.

In the afternoon I motored out to the 15th Casualty Clearing Hospital at Wilhelma and found them at work though the casualties were not coming in very fast. By 4 p.m. 250 wounded had arrived. On the afternoon of the next day, the 20th, I went further up the line visiting the field ambulances of the 54th and 75th Divisions. The former were already practically clear. Neither of these divisions was engaged in the pursuit of the Turks but the field ambulances of the latter had been strung out along the main route of evacuation.

One of the 75th Field Ambulances commanded by Lieutenant-Colonel Lelean was open at Kalkilieh, about twenty miles north of Ludd, and acted as a collecting and transfer post. At the time of my visit it was up to its eyes in work. During the next ten days this unit passed over 5,000 British, Indians and prisoners of war, sick and wounded, through its books. The total wounded reported for the whole Force by the 20th was 1,762 British and Indians and 741 prisoners of war, so that the losses could not be considered very heavy considering the magnitude of the operation and the result achieved.

Every part of the scheme had gone like clockwork. The cavalry reached the plain of Esdraelon without opposition, took Nazareth, almost capturing the Turkish and German Headquarters' staff, and intercepted the retreating Turks at Jenin who surrendered wholesale almost without resistance.

The attack of the 20th Corps had also, after hard fighting, been quite successful and the Turks retreating from this front through Nablus were also caught by the cavalry and Air Force on the road towards Beisan and suffered terribly.

On the 21st I visited the 33rd Casualty Clearing Hospital at Jaffa. They had received a good many casualties during the early part of the fighting, but as the battle had quickly rolled away from the coastal area their work was already practically finished. On my way back I visited the casualty clearing hospital at Wilhelma again and the four at Ludd. Everything was working smoothly and the disposal of the wounded well in hand.

The same day I had an interview at G.H.Q. with the Egyptian Premier, Rushdi Pasha, hoping to interest him in the status of the native

Egyptian medical officers belonging to the Egyptian Government Service, who were serving with the Egyptian Expeditionary Force and who had a grievance in that they were losing the time so spent as it did not count towards promotion. He was a courteous old man and spoke English fairly well. He promised to do his best to get the grievance remedied, but whether this was ever done after the War I do not know. This interview was, of course, some time before the disloyalty and insurrection came to a head in Egypt in which the native medical profession took a full part and into which Rushdi himself was drawn.

(To be continued.)

Current Literature.

GILCREAS, F. W. & DAVIS, W. S. Investigation of the Amylase and Phosphatase Tests as an Indication of Pasteurization. Reprinted from *Ann. Proc. Internat. Ass. Milk Sanitarians*. 1936. 15-32, 1 diagram & 1 coloured pl. [Abstract by the authors.]

Methods for the measurement of the progressive inactivation of enzymes naturally present in fresh milk by heating the product to the time and temperature of pasteurization, were studied with a view to establishing a simple, accurate laboratory test for the control of pasteurization.

The method based on the destruction of amylase was found, in general, to differentiate unheated from heated milk, but it did not distinguish even major variations in treatment. The amylase content varies with the breed, diet and period of lactation of the cow, and occasionally fresh milk was examined which contained so little amylase that it reacted in the test as though heated.

The test based upon the inactivation of phosphatase as developed by Kay and Graham (*Journ. Dairy Research*, 1936, v. 6, 191-203) was also investigated. If the sample is adequately buffered and incubated overnight at 37° C., the enzyme hydrolyses an added phenylphosphoric ester, liberating phenol, which is readily detected quantitatively by the use of Folin's reagent. The blue colour produced by small quantities of phenol lends itself readily to comparison with permanent standards prepared from inorganic solutions; this mode of reading was therefore developed and substituted for the tintometer used by the authors of the test. In this modification of the original procedure the relation of milligrams of phenol per 0.5 millilitre of the sample examined, to time of holding at 143° F. or to per cent of added raw milk has also been established. Variations of five minutes or greater in the heating time were readily distinguished and the addition of as small a quantity as 0.1 per cent of raw milk gave a result indicative of incomplete pasteurization. Variations in temperature were also easily detected. The technique proved equally satisfactory in deter-

mining pasteurization by the ordinary procedure and by the high temperature process.

The phosphatase test was applied to the examination of approximately 100 samples of milk, representing varying conditions of temperature and holding time in commercial pasteurizing plants. A correct evaluation of the character of the treatment to which the milk had been subjected was made in 97 per cent of the specimens.

Reprinted from "Bulletin of Hygiene," Vol. 12, No. 6.

FREDERICK, Robert C., F.I.C. **The Hartridge Reversion Spectroscope for the Examination of Blood for Carbon Monoxide: Improvements in Design, Assembly and Technique.** *The Analyst*, Vol. 62, No. 735, pp. 452-4.

The Hartridge Reversion Spectroscope is probably the simplest way for a medical man to determine the concentration of carboxy-hæmoglobin in the blood in cases of poisoning by carbon monoxide gas.

Hitherto the instrument has been somewhat difficult to use and has required a certain amount of practice before reliable results have been obtainable.

Mr. Frederick has produced an instrument which should present no difficulties in use.

The improvements consist in: (1) Enclosing the instrument so that dust will now be excluded; (2) mounting the instrument on a stand so that the eye-piece is at eye-level; (3) providing improved cells and slides to contain the samples of blood; (4) providing a hooded light to illuminate the wave length-scale; (5) arranging the zero point of the scale to face the operator instead of pointing upwards; the operator cannot read the scale without standing up; (6) increasing the two spectra very much in height; and (7) providing a powerful source of illumination (150 watt electric light) together with improved apparatus for the fine adjustment of the slit. The last two are most important improvements as the dark bands of the spectrum are now sharply in focus and adjustment of the instrument is correspondingly simplified.

HEBESTREIT, H. **Van der Grinten-Schutzhaube und Staubschutzkleidung.**

[**The Van der Grinten Dust-protective Hood and Clothing.**] *Zent. f. Gewerbehyg. u. Unfallverhütung*. 1937, v. 24, 55-6, 4 figs.

The author here calls attention to a hood invented by Herr van der Grinten, a Dutchman, as a protection against dust and suggests that the inventor's name should be used in connexion with it. It has many advantages over the masks and helmuets hitherto used and has been found quite effective in a chemical works where colours are prepared in the finest powders in preventing any of the colour powder reaching the skin of the face or passing through any of the clothing.

The hood is made of battist material which is rendered air and

watertight by treating the outside with varnish or rubber. A large celluloid window is inserted at the front in an aluminium frame bent backwards at the sides so that the range of vision is in no way limited. A tube through which fresh air is pumped is attached to the lower part of the celluloid window and an outlet valve is provided. The hood is quite light and covers the whole head, so that the hair, ears and eyes are protected against dust and fumes. With metal helmets a little dust is often found inside; this arises from negative pressure occurring inside the rigid helmet when the workman breathes deeply on exertion, but does not occur with the soft material of the hood.

Before putting the hood on the workman puts on ordinary overalls over his usual clothing and gum boots, tying the overalls over the boots at the ankles. The hood comes down well over the shoulders and a white overall coat is then buttoned up to the neck and two pairs of gloves put on; one pair is fastened with a rubber band to the sleeves of the under overalls and the other to the sleeves of the overall coat.

Workmen find this hood and clothing easy to work in and it also has the advantage of low cost.

A. J. COLLIS.

Reprinted from "Bulletin of Hygiene," Vol. 12, No. 7.

Reviews.

ROSE AND CARLESS' MANUAL OF SURGERY. Fifteenth Edition. 1937
By C. P. G. Wakeley and J. B. Hunter. London: Baillière, Tindall
and Cox. 1937. Two vols. Pp. xii + 1618. Price 30s.

The publication of yet another edition, within four years of its predecessor, testifies to the continued popularity of this well-known work.

In the preface the authors say that much work has been expended on bringing this edition up to date, and they have been successful—surprisingly so when one considers the range of the book.

There is a new chapter on surgery of the sympathetic nervous system, which clarifies a difficult subject; also one on shock, which includes the result of recent investigations into its causation. It is a pity that the figures on the charts which accompany this chapter are so small as to be almost unreadable.

Recent discoveries and drugs have also not been neglected. The use of McCarthy's resectotome is described and mention is made of sulphouamide-P in streptococcal infections, pregnyl in undescended testis, toxoid in the prophylaxis of tetanus, and tulip fingers.

A book of this size naturally has its weak points, and most of these

seem to occur in the chapter on fractures. In the preface it is stated that "many types of treatment are becoming standardized, i.e. Böhler's methods of treating fractures." The chapter in question would hardly gratify Böhler. No mention is made of the importance of early active movements of the adjacent muscles and tendons coupled with complete undisturbed immobilization of a fracture. Instead the reader is advised to ensowathe the limb in boric lint or wool before applying plaster of Paris, which is to be bivalved to permit of early massage and passive movements: hardly Böhler's teaching.

Further, fractures of the carpus are compressed into thirteen lines, and the need for prolonged immobilization in fractures of the scaphoid is not mentioned.

Taking it all round, however, this Coronation edition is a very fine work. The two volumes are beautifully got up, well printed on good paper, and the illustrations, many of which are new, are clear and to the point.

The authors are to be congratulated.

C. M. F.

ANATOMY AND PHYSIOLOGY OF PHYSICAL TRAINING. By Major R. W. Galloway, D.S.O., M.B., Ch.B., R.A.M.C. London: Edward Arnold and Co. 1937. Pp. vii + 182. Price 6s. net.

The author of this small book on Physical Training has had exceptional experience at the Army School of Physical Training in dealing with the problems presented in connection with the medical aspects. In addition he has qualified as an Instructor in Physical Training, so that at the outset it may be stated that Major Galloway is outstandingly qualified to write on these matters.

The arrangement of the book is excellent. The first half is devoted to a synopsis of anatomy and physiology giving enough of each subject to enable a beginner to understand the why and wherefore of physical training. These chapters have been proved by experience to be sound, as they have formed the basis of lectures delivered to students of the Army School over a period of many years.

To the beginner these subjects must cause much difficulty but he has been helped as far as possible by the inclusion of very clear drawings and the omission of technical names.

The second half of the book is devoted to instructions on how to prepare a physical training table based on the work of Major Kennedy, R.A.M.C., who estimated the energy expenditure of all exercises. It is suggested that a table be constructed of exercises graduated in energy expenditure to suit varying requirements.

Major Galloway is to be congratulated on producing such an extremely useful little book. It should be of the greatest assistance to all teachers of physical training, especially to those who have not lately dealt with the

subject. It will be equally useful to the student who is preparing to become a teacher.

It should be read by all officers of the R.A.M.C. who wish to familiarize themselves with physical training in the Army.

P. T. L. C.

DROITWICH SPA AND THE TREATMENT OF RHEUMATISM. Charles W. Hobson, Ltd., 9, Park Place, St. James's Street, London, S.W. Pp. 54.

We learn from this recent publication that over 1,000 years ago Droitwich Spa began to be famous and its natural supplies of brine were known before the Romans changed its name to *Salina*, and after they left it assumed the name of *Wic* (salt-spring). Later, during Norman times, the prefix *Droit* was added, signifying the King's *right* to taxation. For many centuries afterwards it was famous for its salt mines, while during the last 100 years it has earned a still greater reputation for its brine.

It is seldom possible to read through a complete brochure without becoming a trifle bored but this publication as set out holds the reader's interest from cover to cover. Therein is found all details of the scope of the cure undertaken at the Spa and it is made perfectly clear that the establishment does not attempt to make diagnoses, but that every possible effort is made to apply such remedial treatments to fasciæ, muscles, tendons and joints damaged by chronic septic or other inflammations or the results of disuse following upon trauma, fractures and paralysis of nervous origin. The density of the brine in the baths is so great that the bathers' limbs and bodies are entirely supported. This removes the influence of gravity and enables active movements to be carried out more easily and painlessly. Also, the brine is reported to be radio-active. Treatment for certain heart conditions on the Nauheim principles, and surface hydrotherapy are available within the establishment. It is equipped with a modern electro-medical department where all remedial exercises can be carried out. Droitwich Spa is staffed by highly trained personnel working under the supervision of medical men experienced in this form of treatment resident in Droitwich. The period of convalescence is not forgotten and there is plenty to do and see both in Droitwich and in the ideal surroundings of the Wye Valley and the Malvern Hills. For the convenience of convalescents a list of drives through the Severn Valley, the Shakespeare country, the hop country and the Lower Cotswolds, with road directions and distances, is given at the end. The print and paper are excellent and the whole is illustrated by many attractive and well produced photographs and by two coloured maps. Copies may be obtained on application to the Spa Director, Droitwich Spa, Worcestershire.

Correspondence.

APPENDICITIS.

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

DEAR SIR,—I do not know if correspondence and criticism is now permitted in the Journal, but if so, I feel I must join issue with Major Fletcher-Barrett over his article on "Appendicitis" in the July issue.

I agree with his final remark on the value of knowing when not to operate. But though I do not belong to the school which operates upon every case of appendicitis forthwith, I consider the line of treatment which he advocates not only wasteful in time but actually dangerous.

He describes accurately a typical case of uncomplicated appendicitis. He calls it "an attack suggesting appendicitis," but if he operated upon these cases he would see that the appendix is inflamed.

It is perfectly true that the majority of patients with appendicitis will recover under the treatment that he describes; but some will not, and it is impossible to know beforehand which are the cases which will go on to peritonitis.

The mortality of operation while infection is confined to the appendix is practically nil: once the peritoneum is involved, the patient's life is in danger. The prime object of operating early is to avoid exposing our patients to this danger—why then wait for signs of peritonitis before operating?

There are still thousands of deaths annually from appendicitis. The only way to reduce this mortality is to remove inflamed appendices before they imperil the patients' lives. This we often cannot do, because the patient does not reach us in time. But if he is lucky enough to reach a surgeon early, only very special contra-indications should be allowed to deprive him of the chance of a safe removal of the source of his troubles.

I am, etc.,

C. M. FINNY,

Colonel, R.A.M.C.

INCORPORATED SOLDIERS AND SAILORS HELP SOCIETY.

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—Every year it is the privilege of some senior sailor or soldier to ask for the continued support of the public for the Soldiers and Sailors Help Society with which is incorporated the Lord Roberts Memorial Workshops, that admirable institution for disabled ex-Service men.

The products of the Workshops, the beautiful and finished work of all kinds, are now well known, and it is perhaps realized that the Society's object is to train and employ disabled soldiers and sailors whose disability from war service prevents them from earning an adequate and honourable livelihood in the ordinary employment markets of the country.

That such a noble work should have been started as a lasting memory

to the great Earl Roberts who "died within sight of the battle smoke," visiting the front of the soldiers he loved so well, should appeal for all times to the people of this Nation. The rank and file of the permanent services are largely drawn from "Labour." It is "Labour" whom the British Nation hires to win its "Trafalgars" and "Waterloos," to leave its bones in Waziristan.

Those who return to us unfit to earn their living or with inadequate wound pensions should be the most appealing of all our duties and benevolences.

Without their services the Empire cannot continue, nor this great country earn its wages and its wealth.

The objects of this Society are twofold: firstly, the relief of distress among deserving ex-Service men, and secondly, to put the disabled man, as nearly as possible, on the same footing for earning a living as those who are not injured. The goods that the disabled men make are sold at competitive prices but the badly injured must take longer on their work than the hale.

The Great War is fading into oblivion but the "Regular" soldier and sailor of this Empire is always at war or engaged in dangerous duties for the peace of the world and the protection of our own, and other peoples, in the four quarters of the globe.

May I once again, on behalf of the Chairman of the Society, the Countess Roberts, and her Council, and all those who have contributed to this work in the past, ask the public to contribute again, or to give help for the first time, to a work that should lie very near their consciences.

Cheques should be crossed "Lloyds Bank Ltd." and made payable to Admiral of the Fleet, Sir Roger Keyes, Bt., Hon. Treasurer, Incorporated Soldiers and Sailors Help Society, Room T, 122, Brompton Road, London, S.W.3.

I am, Sir,

Yours truly,

GEORGE MACMUNN,
Lieut-General.

Notices.

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CONSIDERABLE interest was shown in "Tabloid" Sulphonamide-P (p-aminobenzenesulphonamide), the new chemotherapeutic preparation for the oral treatment of hæmolytic streptococcal infections. A special exhibit demonstrated the action of Sulphonamide-P in the blood-stream. Included in this exhibit were clinical and other charts.

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There was also an exhibit of "Tabloid" Medicine Chests and Cases, and "Tabloid" and "Hypoloid" Hypodermic Pocket Cases. These equipments are outstanding examples of compactness and utility.

— — —

THE ROYAL SANITARY INSTITUTE.

THE autumn session of training courses for candidates desiring to enter for the examinations held by the Royal Sanitary Institute and Sanitary Inspectors Examination Joint Board for sanitary inspectors, and by the Royal Sanitary Institute for smoke inspectors, and in general hygiene and sanitation will commence on Monday, September 20, 1937.

A special course will be conducted for students wishing to take the Institute's examination in sanitary science as applied to buildings and public works commencing on Monday, January 10, 1938.

Particulars of the lecture courses and syllabuses of the examinations are obtainable from the Secretary of the Institute, 90, Buckingham Palace Road, London, S.W. 1.



EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects travel, and personal experiences, etc.

Correspondence on matters of interest to the Corps, and articles of a non-scientific character, may be accepted for publication under a nom-de-plume.

All Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps" will (unless the Author notifies at the time of submission that he reserves the copyright of the Article to himself) become the property of the Library and Journal Committee, who will exercise full copyright powers concerning such Articles.

A free issue of twenty-five reprints will be made to contributors of Original Communications and of twenty-five excerpts in the case of Lectures, Travels, Clinical and other Notes, and Echoes of the Past.

Reprints or excerpts, additional to the above, can be furnished on payment if specially ordered at the time of submission of the article for publication.

Communications in regard to editorial business should be addressed: "The Editor, JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, War Office, Whitehall, London, S.W. 1."

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MONTHLY

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RESPIRATION IN HIGH FLYING.¹

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ABSTRACT.—Atmospheric pressure falls, as height increases, to about one-ninth of its sea-level value at 50,000 feet. The intake of oxygen into the blood depends on the partial pressure of oxygen in the inspired air, which is about one-fifth of the atmospheric pressure. But since the gaseous content of the lungs is saturated with water vapour at body temperature, 47 mm. Hg. of the atmospheric pressure in the lungs is due to water vapour and is therefore not available for oxygen or other gases, while the alveolar air contains also an almost constant pressure of 40 mm. CO₂.

Mental and physical output demand an adequate partial pressure of O₂; they begin to be limited as soon as this falls, and at heights above 18,000 feet are seriously reduced. Consequently in order to fly higher than about 15,000 feet it is necessary to increase the partial pressure of oxygen in the inspired air. Up to about 44,000 feet this can be done by merely raising the percentage of oxygen, usually by allowing a regulated stream of oxygen to enter a small naso-buccal mask, but preferably by a closed system in which the negative pressure of inspiration opens a valve and allows oxygen to enter a bag from which it is inspired.

Beyond 44,000 feet as a limit (and a lesser height for safety) it is necessary to create a local atmospheric pressure around the pilot higher than that of the surrounding air, by enclosing him in an airtight suit or cabin in which a relatively increased pressure with a maximum value of about 2½ lb. per square inch is maintained, while he breathes pure oxygen. This device was used in the recent British world record high flight, when a height of

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50,000 feet was attained. The pressure-suit used by the pilot on this occasion and the decompression chamber recently built at Farnborough are described in detail.

RÉSUMÉ.—La pression atmosphérique diminue avec l'altitude, et atteint à 15,200 mètres seulement environ 1/9 de sa valeur au niveau de la mer. La quantité d'oxygène entrant dans le sang dépend de la pression de l'oxygène dans l'air inspiré, qui comporte environ 1/5 de la pression atmosphérique. Mais comme le contenu gazeux des poumons est saturé de vapeur d'eau à la température du corps, une pression égale à 47 mm. Hg est due à la vapeur d'eau, et, par conséquent, n'est pas disponible pour l'oxygène ou d'autres gaz. et de plus, l'air alvéolaire contient une tension à peu près constante de 40 mm. de CO₂.

L'activité physique et mentale demande une pression suffisante d'O₂; elle commence à être limitée dès que celle-ci diminue, et à une altitude de plus que 5,500 mètres elle est gravement réduite. Par conséquent, pour monter plus haut que 4,600 mètres environ, il est nécessaire d'augmenter la pression d'oxygène dans l'air inspiré. Jusqu'à une altitude d'environ 13,400 mètres il suffit d'augmenter la proportion d'oxygène, généralement en faisant passer un courant réglé d'oxygène dans un petit masque naso-buccal, mais il est préférable d'employer un appareil fermé, dans lequel la pression négative due à l'inspiration ouvre une soupape qui permet à l'oxygène d'entrer dans un sac d'où il est inspiré.

Au delà de 13,400 mètres au plus (et à une altitude moins haute pour plus de sûreté) il est nécessaire de créer une pression atmosphérique locale plus haute que celle de l'entourage. l'aviateur étant enfermé dans un scaphandre ou dans une cabine où une pression relativement haute, de 130 mm. Hg au maximum, est maintenue, pendant qu'il respire de l'oxygène pur. Cette méthode a été employée pour obtenir le record d'altitude récemment, quand une altitude de 15,200 mètres fut atteinte. Le scaphandre porté par l'aviateur à cette occasion et la chambre à décompression récemment construite à Farnborough sont décrits en détail.

ZUSAMMENFASSUNG.—Der Luftdruck nimmt mit zunehmender Höhe ab und beträgt um einer Höhe von 15,200 Meter etwa 1/9 seiner Dichte in Meereshöhe. Die Sauerstoffaufnahme des Blutes hängt von dem Sauerstoffpartialdruck in der Einatemungsluft ab; dieser beträgt etwa 1/5 des Luftdruckes. Da jedoch die in den Lungen befindliche Luft bei Körpertemperatur mit Wasserdampf gesättigt ist, ist 47 mm. Hg des in der Lunge herrschenden Gasdruckes dem Wasserdampf zuzuschreiben und kommt dementsprechend weder für Sauerstoff noch für die anderen Gase in Betracht, während die Alveolarluft überdies einen fast konstanten Gehalt von CO₂ von 40 mm. Druck aufweist.

Geistige und körperliche Arbeit erfordern einen hinreichenden Sauerstoffpartialdruck; sobald dieser fällt, tritt eine Beeinträchtigung der Arbeit ein und in Höhen über 5,500 Meter wird die Arbeitsmöglichkeit beträchtlich eingeschränkt. Um das Fliegen in Höhen über 4,600 Meter zu ermöglichen ist daher eine Erhöhung des Sauerstoffpartialdruckes in der Inspirationsluft notwendig. Bis zu einer Höhe von 13,400 Meter kann dies dadurch erreicht werden, dass man lediglich den Prozentgehalt an Sauerstoff erhöht; die übliche Methode hierfür besteht darin, dass man einen regulierten Sauerstoffstrom in eine kleine, Nase und Mund bedeckende Maske einströmen lässt; besser ist es aber ein geschlossenes System zu verwenden, bei dem der bei der Einatmung bestehende negative Druck ein Ventil öffnet und dem Sauerstoff den Eintritt in einen Sack freigibt, aus dem er eingeatmet wird.

In Höhen über 13,400 Meter als untere Grenze (und zur Erhöhung der Sicherheit auch in geringeren Höhen) ist es notwendig, in der Umgebung des Flugzeugführers einen Atmosphärendruck zu erzeugen, der höher ist als der der umgebenden Luft; dies geschieht dadurch, dass man ihn in eine luftdichte Ausrüstung oder in eine luftdichte Kabine einschliesst, in welcher dauernd ein relativ erhöhter Druck herrscht (Maximaldruck etwa 130 Millimeter Hg), während der Flugzeugführer reinen Sauerstoff einatmet. Diese Anordnung wurde bei dem kürzlich vorgenommenen Britischen Welthöhenrekordflug verwendet, bei dem eine Höhe von 15,200 Meter erreicht wurde. Die luftdichte Ausrüstung, die von dem Flugzeugführer bei dieser Gelegenheit verwandt wurde, sowie die kürzlich in Farnborough gebaute Dekompressionskammer, werden ausführlich beschrieben.

MAN is, at least relatively, an intelligent animal, which may be defined as one having the capacity consciously to adapt himself to his environment. He is physiologically equipped for living at an atmospheric pressure normally varying from about 700 to 800 mm. Hg, but, as in most other respects, his equipment enables him to function in environments varying widely from the normal, and provides for ultimate adaptation to even wider variations without the exercise of intelligence. This is illustrated by the fact that any healthy man can ascend to a height of 10,000 ft. without serious embarrassment, and even such embarrassment as then occurs gradually disappears as he becomes acclimatized to that height. The highest level at which man continues to exist for any considerable length of time is about 18,000 ft., but such men as do so become physiologically adapted in respect of pulmonary ventilation, cardiac function, blood content, &c. The work of the numerous Everest expeditions has shown that, given the right degree of acclimatization, man can for a limited time perform prodigies of endurance and effort at much greater heights than this.

Up to a height of about 36,000 ft. (11 km.) atmospheric air contains an almost constant proportion of about 21% of oxygen. Since air is a mere mixture of relatively light and heavy gases, it is at first difficult to understand why its composition should remain thus unaffected by gravity. The explanation lies in the fact that the heating of the atmosphere by radiation, conduction, and convection from the earth ceases to be effective about that height, so that from that level upwards there is none of the vertical churning of the atmosphere caused by convection currents in the region beneath it.

Since the physical conditions of the atmosphere are variable with time and geographical position, it has been necessary to formulate an International Standard Atmosphere, representing with fair accuracy average conditions over the whole world. The atmosphere is divisible into two regions: the lower, or troposphere, in which temperature varies with height, falling (according to this Standard Atmosphere) at a rate of 3.6° F. per 1,000 ft. (6° C. per km.) from 59° F. (15° C.) at sea-level to - 70° F. (- 56.5 C.) at 36,090 ft. (11 km.), and the upper, or stratosphere, in which temperature is assumed to be constant. Thus we may infer that there are continual convection currents in the troposphere, and that it is these which keep the lower atmosphere in constant movement and so prevent its separation into light and heavy constituent gases.

The density of the atmosphere varies with height according to a rather complex formula. The right-hand curve of fig. 1 shows graphically the relation between height and atmospheric pressure, calculated according to the calibration law of the International Commission for Air Navigation. From this it will be seen that atmospheric pressure falls as height increases, the rate of fall being greater near the ground; it is, in fact, about eight times greater at sea-level than it is at a height of 60,000 ft. Thus at 19,000 ft. the atmospheric pressure is half, and at 34,000 ft. one quarter, of what it is at sea-level.

The atmosphere near the earth consists almost entirely of nitrogen and oxygen, with traces of carbon dioxide, hydrogen, and neon, and a relatively large amount of argon—nearly 1%. So far as is at present known, this argon has no physiological significance, but it would be idle on that account to deny it consideration. The atmosphere contains also a variable amount of water vapour, according to the

meteorological conditions, averaging about 1.2% at sea-level (though not in close proximity to the sea) and falling away to a negligible amount at or below 33,000 ft. So far as its gaseous constituents are concerned, the composition of the atmosphere remains almost unaltered up to a height of 36,000 ft., because of the temperature gradient and consequent vertical currents, but in the stratosphere (or "isothermal region", so called because in it the temperature is presumed to be constant) the composition of the air varies. The oxygen content at sea-level is about 21% ; at a height of 50,000 ft. (15 km.) it has fallen to 19.6%, and at 100,000 ft. (30.5 km.) to 15.2%—here the nitrogen has risen to 84.3%, the carbon dioxide has disappeared,

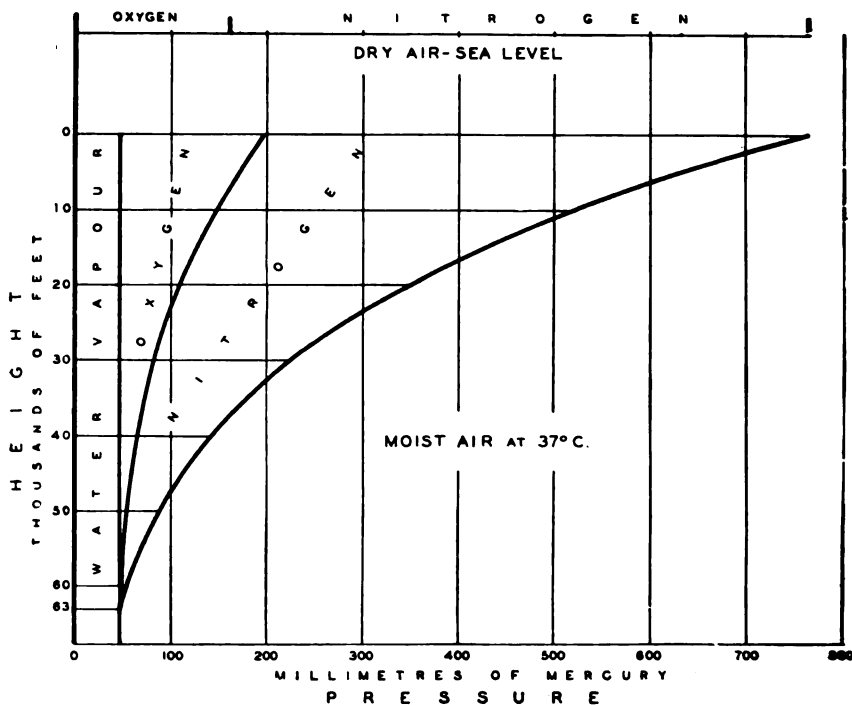


FIG. 1.—Diagram illustrating partial pressures in dry air, and in air saturated with water vapour at body temperature.

the trace of hydrogen present at sea-level has risen to 0.2%, and a trace of helium has appeared. At about 330,000 ft. (100 km.) the atmosphere is almost pure hydrogen.

As there is virtually the same percentage of oxygen in the atmosphere at great height as near the earth, it would at first sight appear that respiration should function just as well there. But oxygen does not pass into the blood-stream of its own accord ; it needs some force to make it do so, and this force is derived from the difference in the oxygen pressure in the atmosphere and in the blood. Dalton's laws tell us that in a mixture of gases in any space the pressure exerted by any component gas is equal to the pressure which that quantity of the gas would exert if it alone occupied, and therefore filled, the space. Now all the quantities of the various components added

together are equal to the volume of the space. Consequently the pressure exerted by any gas in a mixture of gases is the same fraction of the total pressure that its volume is of the total volume, that is, it is the same as the volumetric percentage. Thus, in atmospheric air at its "normal" pressure of 762 mm. Hg, containing 21% of oxygen, there is a "partial pressure," as it is called, of oxygen of 21% of 762, or 160 mm. Hg. Hence the oxygen tension in no part of the blood, under "normal" conditions, can exceed 160 mm. Actually it is everywhere far less than this, being about 80 mm. in arterial blood, 50 mm. in venous blood, and still less in the tissues.

There is yet another factor. When liquid is exposed in a confined space it begins to evaporate. Even if the remainder of the space is filled with gas, at no matter what pressure, some of the liquid will evaporate, and this process continues until the pressure of the vapour in the space is such that the rate at which the molecules of liquid enter the gas is the same as that at which the molecules of liquid already in the gas (i.e. the vapour) return to the liquid. This pressure is not, as in the case of gases, a function of the amount of liquid present (provided that all the liquid is not evaporated, i.e. that there is still some—no matter how little—free liquid left in contact with the gas) but depends solely upon the nature and the temperature of the liquid. Thus, water at a temperature of 98.4° F. (37° C.) exerts a maximum pressure of 47 mm. Hg—that is, so long as any free water remains, the pressure of the water vapour is 47 mm. Hg.

Consequently, if we assume—and if this assumption is not academically correct it is at least in fair accord with the observed facts—that on reaching the pulmonary alveoli the incoming air has a temperature of 37° C. and is fully saturated with water from the moisture constantly present throughout the respiratory tract, it is clear that no matter what the nature or pressure of the inspired air there is present in it water vapour at a pressure of 47 mm. Hg (*see* fig. 1). Hence at the "normal" barometric pressure of 762 mm. Hg there is a total gas pressure in the lungs of 762—47, or 715 mm. Hg. But the gaseous components divide the total gas pressure between them in proportion to their percentages. Therefore, if we wish to determine the true partial pressure of oxygen in the air when it reaches the alveoli (setting aside for the moment the fact that before reaching the alveoli it will have mixed with expired air of different composition) we must first deduct 47 mm. Hg from the atmospheric pressure and then take 21% of the difference—at sea-level this becomes 21% of 715 = 150 mm. Hg.

The amount of oxygen present in the blood is, within certain limits, a function of the amount of hæmoglobin in the blood, and the pressure of oxygen to which the blood is exposed. The upper limit is reached when the hæmoglobin is fully saturated with oxygen, of which it can take up about 1.34 c.c. per gramme. Arterial blood is not quite fully saturated, containing only about 96% of the amount representing full saturation. As the pressure of oxygen in the alveoli falls, the degree of saturation also falls, but not proportionately, the fall in saturation being relatively small until the oxygen pressure has fallen to about half of that necessary for full saturation. About this point the degree of saturation begins to fall off very rapidly as the oxygen pressure continues to fall.

Experiments in "doping" athletes with oxygen indicate that although man can carry on very well with a considerable fall in oxygen pressure from the normal, the slightest fall means some slight diminution of maximum power output. This does

not usually affect the pilot flying at heights below 15,000 ft. (4.6 km.), where the atmospheric pressure is about 430 mm. Hg, because he has little physical work to do. but even at these relatively low levels there is reason to believe that mental processes are perceptibly slowed, and if so, it can only be the drop in partial pressure of oxygen that is responsible, provided that the subject is kept warm.

At a height of 15,000 ft. the oxygen pressure in the wet inspire (that is, in inspired air saturated with water vapour at a temperature of 37° C.) is about 80 mm. Hg. and at 20,000 ft. about 64 mm. Hg, the corresponding oxygen pressures in the alveolar air being about 50 and 36 mm. Hg respectively, and the respective degrees of saturation of the blood with oxygen about 82% and 63%. In practice it is found that the limit of safety lies somewhere between these two heights, and this is in accord with experiments where samples of alveolar air were taken after a short stay at different heights (or their equivalents in reduced atmospheric pressure artificially produced in a decompression chamber). In these experiments it was found that so long as the oxygen pressure in the alveolar air remained above 50 mm. Hg the subject was comfortable; with alveolar oxygen-pressures between 50 and 40 mm. Hg there was some degree of distress, between 40 and 30 mm. Hg severe distress, and unconsciousness usually at or rather above 30 mm. Hg. For these reasons pilots of the Royal Air Force are not permitted to fly, breathing only atmospheric air, above 16,000 ft.

Above this height it is necessary to provide some means of increasing the oxygen pressure in the alveolar air, which means, in effect, in the inspired air. The simplest way to do this is to increase the percentage of oxygen in the inspired air, and this is commonly done by allowing a regulated stream of oxygen to enter a suitable mask secured over nose and mouth, and there to mingle with the inspired atmospheric air, which enters the mask through two apertures of suitable size. The oxygen for this purpose is carried either liquid in Dewar flasks or compressed in light cylinders of special high-tensile steel, the latter method being preferred on account of the difficulty of supplying liquid oxygen in the field. The oxygen from the cylinder, in which it is compressed to 120 atmospheres or about 1,800 lb. per square inch, passes to a pressure-gauge of the usual pattern, incorporating a filter, then through a heater, whose primary object is not the comfort of the pilot but the avoidance of the blockage of the valves by formation of ice from the minute trace of water that is almost inevitably present in compressed oxygen, to a reducing valve, from which it emerges at a predetermined pressure of about 20 lb. per square inch. It then passes through a flowmeter, calibrated in thousands of feet according to the rate of flow calculated to be necessary at the respective height levels, and then by way of a rapid-release bayonet joint to the mask.

This method is fairly satisfactory for moderate heights, but it has certain disadvantages. Since inspiration occupies only about one-third of the respiratory cycle, and the flow of oxygen is constant, it is clear that for two-thirds of the time of use the oxygen is merely pouring out to waste, so that provision must be made for carrying three times as much oxygen as is actually used. But there is a more serious disadvantage in this open method of administration. The rate of oxygen consumption required for only moderate physical work greatly exceeds the consumption during the relative inaction of piloting an aircraft, and this increased requirement is manifested by increased respiration. Thus a larger volume of air passes through the

nostrils of the mask in unit time, while the volume of additional oxygen delivered by the supply apparatus in unit time remains unaltered. Consequently the mixture entering the lungs becomes poorer in oxygen when physical output is increased, i.e. the partial pressure of oxygen in the inspired air decreases and a vicious circle is established, for the response to lack of oxygen is panting, and this increases still further the relative lack of oxygen in the inspired air.

Hence this open-mask method of administration of oxygen is one which requires adjustment according not only to the height, but also to the rate of doing work. This is a serious drawback in the Service, where the rate of doing physical work cannot be accurately forecast from one minute to the next, so that when there is any immediate prospect of heavy exertion, the subject must increase the rate of oxygen flow beyond that calculated as necessary for the height at which he is flying.

A better method is to make use of the lung-controlled principle, in which oxygen passes by way of a very fine valve into a small rubber bag about the size of a small hot-water bottle, from which it is inspired. The act of inspiration deflates the bag and so causes two light wire frames inside it to approximate, thus opening the valve and allowing the bag to refill with oxygen, when the separation of the wire frames closes the valve and stops the oxygen flow. The subject breathes through inspiratory and expiratory valves, so that his expirate does not mix, outside the body, with his inspire. In this connexion it is interesting to note that the inspiration of oxygen instead of air does not of itself alter the pulmonary ventilation, yet it is a remarkable fact that in using such an apparatus at an atmospheric pressure of about 140 mm. Hg, which corresponds with a height of 40,000 ft., I have more than once observed that the subject has stopped breathing. This cannot be analogous to the apnoea following on forced breathing, whereby the carbon dioxide is excessively washed out of the system, since there is no excessive pulmonary ventilation and the carbon dioxide content of ordinary air is too small to have any physiological significance. So far as I can trace, this phenomenon has not been previously reported, nor can I offer any theory to account for it. It could, no doubt, be avoided by adding a small percentage of carbon dioxide to the oxygen used, but its causation would still be obscure.

Now this process of preventing the oxygen want that would otherwise inevitably occur in high flying by raising the oxygen content of the inspire is satisfactory up to the point where the oxygen percentage is 100 and the height such that the total atmospheric pressure is equal to the partial pressure of oxygen in ordinary air at about 18,000 ft. Fig. 1 shows that this height is about 44,000 ft., and it is interesting to note in confirmation that a young, healthy, and experienced subject fainted in the decompression chamber, when breathing only oxygen, at a pressure corresponding to a height of 44,000 ft.

What, then, is to be done to enable men to fly above this height? We cannot increase the percentage of oxygen beyond 100, and we must therefore create around the pilot an artificial atmospheric pressure which never falls below some arbitrary value well above that corresponding with our limit of 44,000 ft., or about 120 mm. Hg. This can be done by enclosing him in either an airtight cabin or an airtight suit, in which the pressure is raised above that of the surrounding atmosphere to a constant absolute value. For technical reasons of aircraft construction, the airtight cabin is the less practicable of the two, as the relatively large size of an aircraft cabin

demands considerable additional strength to enable it to withstand the added internal pressure over so large a surface, and this means too much weight. Use is therefore made of a sort of diving suit (fig. 2) made of rubberized fabric, fitted with a helmet of the same material, with a large curved double window. The suit is made in two pieces, upper and lower, joined at the waist by means of a flexible steel band (2, A) which is tightened on to a rigid hoop, clamping the two layers of fabric together.

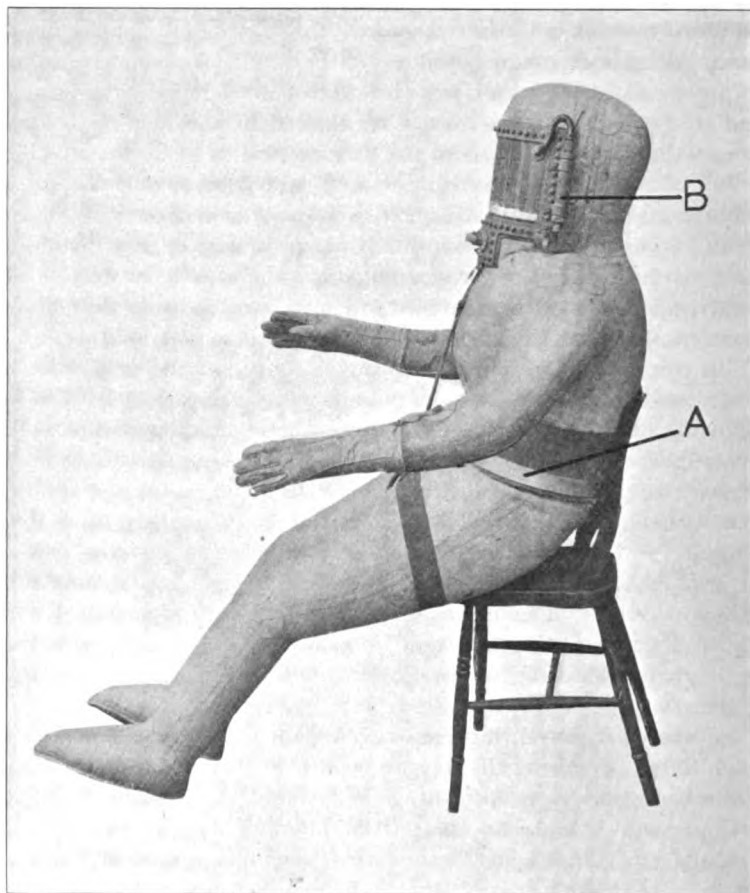


FIG. 2.—Pressure Suit for flying at very high altitude. A, steel waist-band sealing joint between two halves of suit; B, drying-tube.

(Crown copyright reserved.)

The space between the two layers of the window is kept dry, in order to prevent the formation of mist or ice where it would obstruct vision, by means of a drying-tube (2, B) at the side of the helmet, the air passing into and out of this space, by way of the drying-tube, as the barometric pressure rises and falls. The pilot breathes nothing but oxygen, which is supplied by means of an injector which ensures circulation through a soda-lime canister. This absorbs both carbon dioxide and water, and incidentally warms the circulating oxygen in doing so. The pressure within the

suit is automatically adjusted so as not to exceed a fixed value of about $2\frac{1}{2}$ lb. per square inch, or 130 mm. Hg, above that of the surrounding air. The oxygen pressure in the dry inspirate is therefore always at least 130 mm. Hg even in a vacuum, and is thus able to support life at infinite height. At a height of 80,000 ft. (24.2 km.), which is considerably higher than any aerodyne¹ is likely to attain for some time to come, the pilot will receive oxygen at a pressure of 150 mm. Hg, and is therefore under similar physiological conditions to those when flying without oxygen at about 9,000 ft. (2.7 km.)—a height no greater than is habitually attained by many commercial aircraft. This internal pressure-difference must not be too high, or it would seriously impede the movements of the pilot's limbs; at the value prescribed the wearer is easily able to make every movement required in piloting.

It may be asked why the necessary additional oxygen pressure in the lungs cannot be provided more simply by supercharging the pilot. An internal-combustion engine can be supercharged in order to increase the mass of mixture entering the cylinder, and it might be practicable to apply this method to the lungs were it not for the fact that a small increase of intrapulmonary pressure impedes the pulmonary circulation and causes an intolerable resistance to expiration. But if the pressure is applied outside the trunk as well as inside it this objection disappears, and this is in fact what is done in the pressure suit.

When existence under reduced atmospheric pressure is prolonged, there is an increase in the number of red corpuscles with a corresponding increase in the amount of hæmoglobin in the body. This is one of the adaptations which make it possible for mountain climbers to ascend gradually to, and live in tolerable comfort at, much greater heights than would be possible if they were suddenly transported there, as in an aircraft. This, however, is a relatively slow process, and has but little application to high flying. It is true that frequent and prolonged flights at as great heights as are permissible without oxygen will bring about a small increase in the red cell count, but this is only transient, and the increase in oxygen capacity of the blood thus gained is of but little practical value, as it adds only a few thousand feet to the pilot's ceiling.

DECOMPRESSION CHAMBER

In order to test the applicability of these theoretical considerations, and for other experimental purposes, use is made of a decompression chamber. There are many of these in different countries, owned by governments, universities, and private firms or individuals, and they are used for many studies other than physiological. The Air Ministry has three, of which the one now to be described is at the Royal Aircraft Establishment, South Farnborough, Hampshire, and was designed primarily for physiological purposes. This chamber (fig. 3) has proved in use to be so well designed that I cannot suggest a single particular in which alteration would make it more suitable.

The chamber consists of a cylindrical vessel, with axis vertical, measuring internally 8 ft. 2 in. high by 7 ft. 0 in. diameter (249 × 213 cm.). The top and bottom, which in such chambers are usually domed to resist pressure from without, are here made of flat steel plate $\frac{3}{8}$ in. thick (1.8 cm.), each reinforced with four channel-steel joists, and the walls are of $\frac{5}{8}$ in. (1.6 cm.) steel plate. A door of $\frac{5}{8}$ in. steel plate,

¹ Aircraft heavier than air.

reinforced with angles and measuring 6 ft. 3 in. by 2 ft. 0 in. clear (191×61 cm.), is set in a slightly projecting framework and hung on hinges slightly slotted to allow of the necessary play in making it airtight on closing. It beds on to a rubber joint $\frac{1}{2}$ in. thick (1.3 cm.), and is held into position by two hand screws. These screws

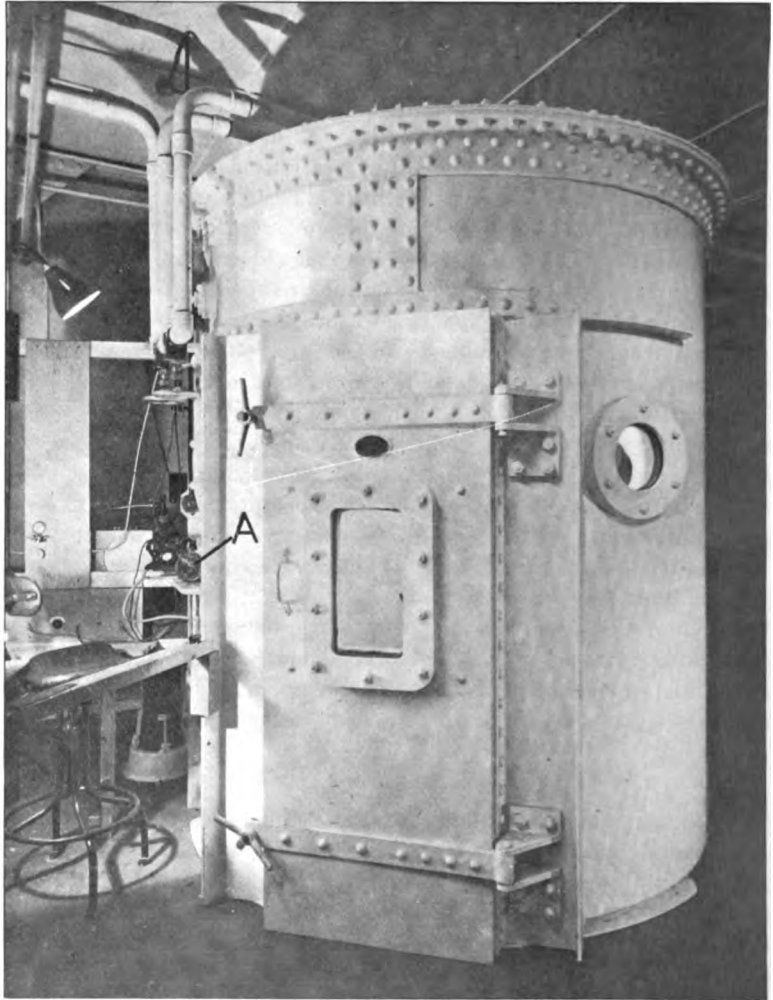


FIG. 3.—Decompression Chamber, R.A.E., Farnborough. A, device for showing rate of ascent or descent.

(Crown copyright reserved.)

are necessary only at the beginning of evacuation, since the differential pressure on the outside of the door, which tends to force it shut, soon becomes far greater than could be produced by the screws. Since the area of the doorway is $12\frac{1}{2}$ sq. ft. (1.2 sq. m.), an internal pressure reduced to correspond with a height of only 5,000 ft. (1.5 km.) causes an atmospheric pressure on the outside of the door of 2 tons, while at 30,000 ft. (9.1 km.) the pressure is over 10 tons. In the upper half of the door is a

window 1 ft. 6 in. high by 9 in. wide (46×23 cm.) of $1\frac{1}{8}$ in. plate glass. The capacity of the chamber, including the spaces beyond floor and ceiling, is 400 cubic feet (11.3 cu. m.).

Equally spaced around the circumference are four 9-in. circular windows of $\frac{7}{8}$ -in. plate glass (fig. 4, D), placed 5 ft. above external ground level, with a fifth at



FIG. 4.—Decompression Chamber, interior. A, air-tight conduits for passing pipes, &c., through the wall; B, low-tension electric terminals; C, altimeter; D, observation windows. (Crown copyright reserved.)

3 ft. 8 in., the purpose of the latter being close observation of experimental subjects, especially to detect incipient cyanosis. All windows are permanently closed and airtight. The ceiling and floor are of wood. The chamber is lined throughout with $\frac{1}{4}$ -in. felt, which is white on walls and ceiling in order to reflect the maximum amount of light; without this felt the echoes make conversation in the chamber almost unintelligible. The internal lighting is by four separate 100-watt daylight blue lamps in porthole-type fittings; this is quite enough to enable the onset of cyanosis, which

is invisible in the yellow light of ordinary bulbs, to be detected. All electric leads are passed through the walls by way of airtight glands. In the wall of the chamber are four short pipes (fig. 4, A) closed with screw caps when not in use, through which any necessary additional tubes or electric leads can be passed in suitable packing. Three low-tension electric terminals (fig. 4, B) are provided for experimental apparatus—common negative, and 6-volt and 12-volt positives.

The machinery required to operate this chamber consists of a water-cooled reciprocating pump driven through a heavy flywheel by a $7\frac{1}{2}$ -h.p. electric motor, having a volumetric capacity of 148 cu. ft. (4.2 cu. m.) per minute. This is capable of reducing the pressure in the chamber to $\frac{1}{4}$ lb. per sq. in. (12.7 mm. Hg), corresponding to a height of 90,000 ft., while maintaining at the same time a ventilation rate of $\frac{1}{2}$ cu. ft. (14 litres) of free air per minute, which is equal to sixty times as much of the attenuated air in the chamber under such conditions. Ventilation at such a "height" is of no consequence for the replacement of used oxygen, because no one could survive exposure to so attenuated an atmosphere, even if he were to breathe pure oxygen. At lesser heights, however, this ventilation is of value, since it serves to reduce the humidity of air caused by the sweat and exhalations of the occupants, which would otherwise make the heat produced by the recompression of the air on returning to normal pressure almost intolerable.

The 2-in. suction pipe from the pump (fig. 5, A) divides into two branches; one (B) goes through a valve to the outer air, and the other (C) through a valve to the chamber, where it enters above the ceiling through a Burgess silencer and two flame-traps, arranged in series and having an effective area of 16 sq. in. Another, but independent, pipe (D) connects the chamber direct with the outer air through a valve (E), with a branch connexion for flooding the chamber with oxygen in emergency. These safety measures are by no means to be despised; on at least one occasion they have averted what might have been a tragedy.

The pump runs at constant speed and the atmospheric pressure in the chamber is controlled entirely by the valves. When the pressure is to be kept constant, as is usually the case in experimental work, but with no ventilation, the suction pipe leading to the pump is therefore closed, thus relieving the pump of work, for it quickly establishes an almost perfect vacuum on each side of the pistons, and then does virtually no work at all.

Great care has been given to the comfort of the operator in order to ensure that his attention will not be distracted. One man alone is needed for the entire operation of the chamber. He sits on a specially designed seat with all gauges within his field of vision and all controls accessible without stretching. The seat is adjustable in height to bring the operator's eyes to a convenient level, and since he has a 9-in. porthole window 5 ft. above the floor he can change to a standing position at will, and so relieve the tedium of prolonged sitting. A strong light above his head is directed on to the gauges and controls, a telephone is at his hand in case he may need assistance, and a red button (F) at his side serves to stop the pump instantly in emergency. At his side is a loud-speaker (G), and there is another inside the chamber, so arranged that the one in the chamber normally acts as a microphone, the one outside broadcasting every sound made in the chamber. By pressing a button (H) the operator can exchange the respective roles of the two loud-speakers and can thus speak to the occupants.

The gauges consist of an altimeter (fig. 4, c) in the chamber, which can be read from without as well as from within, while outside the chamber, within sight of the operator, are a device (fig. 3, A) for showing the actual rate of ascent

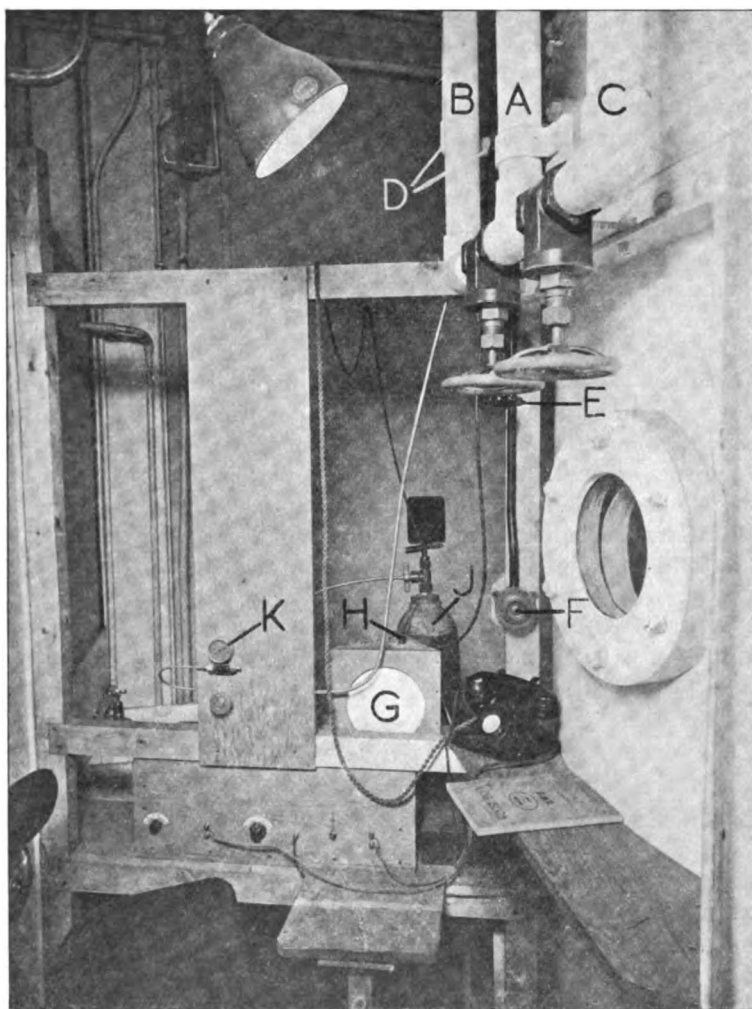


FIG. 5.—Decompression chamber, controls. A, suction pipe to pump; B, suction pipe from outer air; C, suction pipe from chamber; D, independent pipe to outer air and to oxygen cylinder; E, valve controlling D; F, button for stopping pump; G, microphone-loud-speaker; H, change-over switch for G; J, oxygen cylinder for emergency use; K, oxygen pressure-gauge. (Crown copyright reserved.)

or descent at any moment, a pressure-gauge, a mercury manometer, and a large oxygen cylinder (fig. 5, J) with pressure-gauge (κ) and flowmeter.

The maximum rate of ascent afforded by the pump is adequate for all purposes ; +0,000 ft. (12.2 km.) is reached in five and a half minutes, 70,000 ft. (21.3 km.) in

twelve and a half minutes, and 90,000 ft. (27.4 km.) in thirty minutes, while the descent from 90,000 ft. can be made in twelve minutes.

A special feature of the chamber is the extraordinary silence of operation. The pump and motor are housed about 20 ft. away in a sound-insulated room, with provision for avoiding the propagation of sound from the pump along the suction pipe, so that in the room where the chamber is situated all that can be heard while the pump is in operation is a low hum. In the chamber is a loose table, in shape a segment of a circle, which can be removed if desired to make room for bulky apparatus, such as a bicycle ergometer, for which there is ample room.

The oxygen supply for persons in the chamber is not built-in, but provided by means of the standard Service apparatus as used in aircraft, which has already been described, as also the oxygen cylinder outside the chamber for emergency use and the short tubes in the wall of the chamber through which an additional supply can be piped in suitable packing if this should ever be necessary.

All respiratory physiology is based on the fundamental work of the great masters of the past and present, notably Paul Bert, Haldane, and Barcroft, and their schools, to whose writings grateful acknowledgment is due ; because this approach to the subject was made from a purely practical standpoint, however, some of the theories here advanced were independently conceived in regrettable ignorance of the fact that they were not original. Acknowledgment is due also to the Chief Superintendent, Royal Aircraft Establishment, for constant help, to Sir Robert Davis, managing director of Messrs. Siebe, Gorman & Co., Ltd., for permission to show the pressure suit, and to the proprietors of *The Aeroplane*, for the loan of photographs.

OXALURIA IN A TROPICAL STATION.

BY CAPTAIN C. A. DE CANDOLE.

Royal Army Medical Corps.

INTRODUCTION.

THE present investigations were undertaken in an attempt to account for a number of cases presenting minor urinary troubles which have come under observation in the wards and medical inspection room during the past year in Mingaladon, Burma. These, taken in conjunction with the oxaluria which was found to be prevalent among normal people in this place, a fact to which attention was first drawn by the frequent finding of calcium oxalate crystals in routine urine examinations done in the laboratory, lead to an attempt to establish whether or not there was any connexion between the two, and, although proof is lacking, a strong supposition that this is so remains.

PRELIMINARY CONSIDERATIONS.

(1) *Significance of Oxaluria.*—How much, and in what circumstances, importance is to be attached to the finding of calcium oxalate crystals in the urine is still undecided. Most people are agreed that oxaluria, or at all events “transient” oxaluria, provided the crystals are not present in excessive amount, is without clinical significance. Dunlop (1895) found them in the urine of 35 per cent of normal individuals. Furthermore, the point is emphasized by Neuberg (1907) that the quantity of oxalic acid present as a sediment is far from being a measure of the actual amount of this acid in the urine, the amount of insoluble calcium oxalate formed varying with the acidity and with the CaO : MgO ratio.

The difficulty is to determine first of all what constitutes “transience,” and secondly, what is the normal quantitative upper limit. As regards the latter, opinions diverge widely, and, according to the authority consulted, the limit considered consistent with normality ranges from 2 to 290 milligrams of oxalic acid daily. There is an equal lack of precision over the question of how long a period of oxaluria may be regarded as compatible with health, and how long must elapse before it recurs.

(2) *Pathology.*—It seems probable, however, that from a pathological standpoint, the sole claim of oxaluria to be taken seriously arises from its undoubted association with the formation of urinary calculi, most of these having an oxalate nucleus. In the past, various other morbid conditions have been attributed to it, but these are now generally discredited.

Apart, however, from actual calculus formation, no one seems to deny the possibility that calcium oxalate crystals may damage the kidney

mechanically during the process of excretion, producing congestion, albuminuria and even hæmaturia, but it is quite unsettled what are the precise circumstances in which they do so. The evidence is of two kinds: (a) The presence of urinary symptoms in cases of poisoning with oxalic acid; and (b) the association of hæmaturia and pain in the urinary tract with oxaluria. The literature is full of examples of the latter, usually following excessive consumption of vegetables, most commonly rhubarb. Such a syndrome occurs in some men every year.

(3) *Origin*.—The question of how oxalic acid originates in the body is not altogether settled. Everyone agrees that articles of food containing it are a source, and some maintain the only source. The consensus of opinion, however, is that, in addition to this exogenous source, oxalic acid is formed endogenously in the course of metabolism, but that this method of formation is relatively unimportant. The usual explanation of an increase in the amount secreted is that it is due to some digestive disturbance such as achlorhydria, hyperchlorhydria, or pancreatic disease, either causing excessive fermentation in the gut, or facilitating the absorption of oxalic acid from food containing it. Piccini and Lombardi (1925) showed that certain strains of the *Bacillus coli* produce oxalic acid in culture, and that ingestion of these cultures can result in oxaluria in people hitherto free from it.

More recently, and since the present work was undertaken, Fink (1936) has published evidence that oxaluria may be accompanied by certain intestinal parasites, and be diminished or even abolished altogether when these are eliminated. The parasite found in the majority of his cases was the *Ascaris lumbricoides*, but there were also found *Giardia lamblia*, a tænia, and the *Entamæba coli*. He attributes the oxaluria to pancreatic dysfunction; the parasites interfering with its external secretion, leading to incomplete digestion of starch.

Quite recently, too, a condition has been described under the name of "oxalæmia," where various symptoms are ascribed to an excess of oxalic acid in the blood (Loeper, 1936).

OXALURIA AMONG NORMAL PEOPLE.

It is incontestable that oxaluria is extremely prevalent among normal people in Mingaladon. The term is used simply to mean the presence of crystals of calcium oxalate on a slide under the microscope, after hand-centrifuging about five cubic centimetres of urine for one minute. It implies nothing as regards quantity, permanence, or any associated sign or symptom.

Table I shows the findings for 190 normal British soldiers. A specimen of urine was taken on one occasion only from each, when they attended at the hospital for antityphoid inoculation. The possible significance of the white cells will be discussed later.

This figure of 50 per cent is considerably higher even than that of

Dunlop, and, inasmuch as only a single examination from each individual was made, it is almost certainly too low.

TABLE I.

Total number examined ..	..	..	190		
Number showing Ca. Oxalate crystals ..	..	95	..	50 per cent	
Number showing white cells ..	..	84	..	44.2	„

Evidence of this is provided by the results set down in Table II. In this small group, repeated daily examinations were made of the urine of patients in hospital. It will be seen that, with one exception, the incidence calculated over the whole period is higher than that found on any one day.

TABLE II.

Day of month	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	16th	17th	Summary of whole period
Number of patients examined ..	12	12	13	14	15	15	16	11	11	6	2	7	10	32*
Number showing oxalates	4	3	2	4	1	8	12	2	4	1	—	2	1	20
Percentage ..	33.3	25	15.3	28.5	6.6	52.8	80	18.1	36.2	16.6	—	28.5	10	62.5

* This figure represents the total number of individuals whose urine was examined during the period.

No examinations were carried out on the 15th.

This is no "transient" oxaluria; oxalate crystals are not to be found in every specimen passed, but individuals prone to excrete them continue to do so day after day. This fact is further illustrated in Tables IV, VI, and VII.

Oxaluria is also prevalent among non-Europeans; a group of forty-five Burmans and Indians examined showed calcium oxalate crystals in twelve, which gives a percentage of 26.6.

CONFIRMATORY TESTS.

The identity of the crystals seen under the microscope was confirmed by chemical tests as described by Braithwaite (1930). As some doubt appears to exist whether or no the other forms such as "dumb-bells" and "biscuit-shapes" really are oxalates, only specimens showing "envelope" crystals were included as positive.

In order to provide evidence that these crystals are actually formed in the urinary tract, and not deposited subsequently, specimens from a number of cases were centrifuged and examined immediately after they were passed. The same specimens were re-examined after six hours, and again after twenty-four hours. No case negative at the first examination became positive at the second, but one did so at the third. Care was therefore taken to ensure that all specimens were examined without delay, and in

practice nearly all were centrifuged within two hours. The exceptions were those of certain patients in hospital, where examinations were made morning and evening of all specimens passed in the interval, so that a maximum of nearly twelve hours might elapse. The findings from two of these cases are shown in Table VI.

POSSIBLE CAUSES.

Likely causes of this unusual prevalence of oxaluria were reviewed. In the absence of widespread digestive disturbance among the troops—and there was no other evidence to suggest this—the most likely explanation seemed to lie either in the climate, leading to excessive loss of moisture from the skin and hence an abnormally concentrated urine, or to the diet containing an unusually high proportion of oxalic acid.

As regards the climate, these investigations were carried out mainly during the monsoon, at a time when the temperature was not unduly high, the maximum being between 80° and 90° F. The humidity often approached saturation, and rarely fell below 70 per cent. These conditions are not such as to cause very considerable evaporation from the skin.

On the other hand, symptoms of actual urinary trouble, hæmaturia and the like, were more frequent during the hot months of May and October preceding and following the monsoon, if it is possible to draw conclusions from the small number observed. This is shown in Table III, in which the incidence by months is shown of the eighteen attacks which were seen, ten out of the total taking place in those two months.

TABLE III.

Month	Jan., Feb., Mar.			Apr., May		June, July, Aug., Sept.				Oct., Nov.		Dec.
Climate	Cool and dry			Hot and dry		Cool and very damp				Hot and dry		Cool and dry
Number of cases	—	—	1	—	5	—	1	1	1	5	2	2

In searching for a possible dietetic cause, the claims of the foodstuffs known to be rich in oxalic acid were examined. Those in common use are mostly fruit and vegetables, particularly rhubarb (0·24 per cent) and spinach (0·32 per cent), tea (0·37 per cent), cocoa (0·45 per cent), pepper (0·32 per cent), coffee and chocolate. Oxalic acid is also a product of the metabolism of gelatine. In addition, bread and potatoes each contain a small amount. Of these, the only ones consumed by everyone among the troops in large quantities are tea, bread and potatoes. Certain individuals eat a lot of fruit, but the majority are reluctant consumers of this and vegetables. The oxalate-containing articles of diet common both to Europeans and non-Europeans are tea, vegetables and potatoes.

On the face of it, tea seemed a likely cause, and certain evidence is brought forward in support of this, although analysis of a sample of the ration tea by the Government Analyst gave a content of only 0·06 per cent.

Five volunteers, after being under observation for eighteen days on their ordinary diet, agreed to forego tea for a week. The findings are shown in the following table. It will be seen that oxalate crystals disappeared entirely for the first five days of the week of abstention, but in the case of two of the volunteers, reappeared in the last two. It is possible that this may be due to infringements of the régime, which they were finding very irksome.

Incidentally these results raise the questions why out of five men living under identical conditions, and eating and drinking the same things, one should show oxaluria persistently, three intermittently, and one not at all.

TABLE IV.

		Ordinary diet																	Period of abstention from tea							
Days	..	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	1	2	3	4	5	6	7
Private M.	..	A	A	A	A	A	A	A					A	A	A	A	A	A		A	A	A	A	A	A	
Rifleman J.	..	A	A	A	A	A	A	A	A		A	P	A	A	A	A	P	A		A	A	A	A	A	A	A
Rifleman W.	..	P	A	P	P	P	P	P	P			A	P	P	P	P	P	P	A	A	A	A	A	A	A	P
Rifleman P.	..	A	A	A	P	A	A	A	A			A		P	P	P	P			A	A	A	A	A	P	P
Rifleman D.	..	A		P	A	P	A	A	P	A			P	A	P	P	P		A	A	A	A	A	A	A	A

A = Oxalates absent.

P = Oxalates present.

Some further evidence regarding the role of tea in producing oxaluria will be found in Tables VI and VII, in which are set out the findings of two cases investigated in hospital.

FEATURES OF THE CASES WITH URINARY SYMPTOMS.

The essential features have been hæmaturia and often lumbar pain, lasting for one or two days, usually following strenuous exercise, "coming off a cross-country run," "while in training for boxing," "when a defaulter."

Apart from the presence of oxalate crystals, and this not constantly, often in association with the red blood-corpuscles in the urine, examination has shown no physical signs. Such radiograms as it has been possible to take have shown no abnormality; the urine has been free from pus and sterile on culture. There has been no pyrexia or constitutional upset: in some cases a mild degree of frequency and pain on micturition have occurred. The intensity of the lumbar pain has been variable; in a few cases it was severe and accompanied by tenderness on deep palpation of the kidneys, but in the majority slight or absent. Complete recovery has invariably taken place within a few days, but there is a marked tendency to relapse.

The majority of these cases have shown a few white cells in the urine after centrifuging, with or without oxalate crystals as well, but not in sufficient numbers to merit the term "pus." The same thing is true,

however, of a large percentage of the 190 normal individuals as well—see Table I. White blood corpuscles cannot be regarded as a normal constituent of urine, and, if the idea of the oxalate crystals being formed in the renal

TABLE V.

Case	Date	Lumbar pain or tenderness	Micturition symptoms	Exertion factor	Hæmaturia	X-ray	Sterility	Urine			
								Alb.	R.B.C.	W.C.	Oxalates
1	Nov., 1935	Nil	Pain at the end	Nil	Urine red one evening	—	—	Nil	Few	++	Nil
2	Oct., 1934	'Lumbago'	Nil	Takes no avoidable exercise	Blood at beginning of micturition	—	Yes	No record of examination			
	May, 1936	Severe rt.-sided	Difficulty in starting	"	"	Neg.	Yes	Nil	+	++	+
3	Mar., 1936	Right-sided	Pain and frequency	In training for boxing	Urine often dark	Neg.	Yes	No record of examination			
	July, 1936							Nil	Nil	+	+
4	May, 1936	Nil	Scalding	After a cross-country run	Marked for two days	—	—	Trace	++	Few	+
5	May, 1936	Nil	Slight pain at end	Returning from run	Urine seen to be dark	—	—	Nil	++	Nil	Nil
6	July, 1936	Severe with vomiting	Slight scalding	Moving heavy boxes	Not macroscopic	—	—	Nil	+	+	+
7	Oct., 1936	Bilateral not severe	Frequency	Training for boxing	Nil	—	—	Trace	Nil	Nil	+
8	Oct., 1935	Nil	Scalding	After physical training	Urine dark in morning	—	—	No record of examination			
	May, 1936	Pain in groin		After a run	Urine dark	—	—	"	"	"	"
	Oct., 1936	Pain in abdomen	Painful	Defaulter	Not macroscopic	—	—	Nil	+	Few	+
9	Sept., 1936	Nil	Nil	Nil	Urine dark	—	—	Trace	++	+	Nil
	Nov., 1936	Continuous ache—left	Nil	Nil	Nil	Neg.	Yes	Nil	Nil	Nil	+
10	Oct., 1936	Severe lt.-sided	Nil	Long day's shooting	Not macroscopic	—	—	Nil	+	Nil	+
	Dec., 1936	Severe, going into groin	Nil	First game of tennis	"	Neg.	—	Nil	++	Nil	+

+ = present ; ++ = present in large quantities.

tubules be accepted, these cells may be regarded as the result of slight irritation, short of damage sufficient to cause hæmaturia.

The signs and symptoms of ten typical cases have been selected for

TABLE VI.

Diets ..	Ordinary barrack diet	Oxalate-free diet				
Oxalate crystals	O O O O O	OOO				
Specimens	XXXXXXXXXXXXXX	XXXX	XXXXX	XXXXXXXXXXXXX	XXXXX	XXXXXXXXXXXXX
Days ..	Period of 20 days prior to admission	1st	2nd	3rd	4th	5th

Diets ..	Twelve ounces of bread added		Two pints tea added	Five pints of tea added	
Oxalate crystals			O	OO O	
Specimens	XXXXXXX	XXXXXXXXXXXXX	XXXXXXX	XXXXXXXXXXXXXX	XXXXXXXXXXXXXX
Days ..	6th	7th	8th	9th	10th

Diets ..	Ordinary barrack diet	
Oxalate crystals	OOO	OOO O OO
Specimens	XXXXXXXXXXXXXXXXX	XXXXX
Days ..	11th	12th

TABLE VII.

Diets ..	Ordinary barrack diet	Oxalate-free diet plus 12 oz. bread		Oxalate-free diet		Oxalate-free diet plus fresh tea	
Oxalate crystals	OOOO	OOOO	OOO	OOOOO	OOO		
Specimens	XXXX	XXXXXXXX	XXXXXX	XXXXXXXX	XXXXXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX
Days ..	1st	2nd	3rd	4th	5th	6th	7th

X = Specimen free from oxalate crystals.

O = Specimen containing oxalate crystals.

tabulation in Table V. These, and the history, are characteristic enough of gravel in the urinary tract, and there seems no reason to doubt that they are of this nature, other possibilities having been in the main excluded by the appropriate measures. It has not, however, been possible

to establish that the gravel concerned is in all cases calcium oxalate, although the supposition is very strong.

TREATMENT OF OXALURIA.

The first and most obvious thing is to eliminate from the diet articles containing much oxalic acid, and to cut down those containing lesser amounts. The next thing is to increase the intake of fluids, and for this purpose certain mineral waters are recommended, particularly those of Contrexeville and Vittel.

Regarding drugs, there is the choice of either administering alkalis to diminish the absorption of oxalic acid from the intestine, or acids to facilitate the formation of soluble salts in the urine. Loeper (1912) says that theobromine, urotropine, and caffeine aid in the elimination of oxalic acid.

Another indication, on biochemical grounds, is to diminish the calcium intake and increase that of magnesium, so that magnesium oxalate, which is soluble, may be formed instead of insoluble calcium oxalate.

EFFECTS OF OXALATE-FREE DIETS.

In the cases under discussion hæmaturia and lumbar pain cleared up without any treatment. Those who reported sick were kept in bed on a milk diet, and were usually given a mixture of 15 grains each of potassium citrate and bicarbonate, with 20 minims of tincture of hyoscyamus.

In addition, however, several were put on an oxalate-free diet, and it was found that the crystals of calcium oxalate disappeared from the urine in a most striking way within a few hours of restricting the diet, and returned equally rapidly as soon as ordinary food was permitted. The strictest diet used forbade the following: tea, coffee, cocoa, chocolate, vegetables, fruit, jam, pepper, jelly and bread. Later 12 ounces of bread a day were allowed and also tea freshly made in the ward, one-third of an ounce a day, without reappearance of the crystals.

Tables VI and VII show the findings in two cases, where every specimen passed over the whole period was examined.

SUMMARY AND CONCLUSIONS.

(1) Ten cases are described presenting signs and symptoms consistent with gravel of the urinary tract, such cases having been seen relatively commonly in Mingaladon.

(2) Associated with these symptoms, oxaluria has been a frequent finding.

(3) The urine of 190 normal Europeans and of 45 normal non-Europeans was examined, and oxalates found in 50 per cent of the first group, and in 26.6 per cent of the second.

(4) Attempts to discover the cause of this wide-spread oxaluria were not fruitful. The part possibly played by intestinal parasites in its ætiology

was not investigated. Infestation is not, however, prevalent among the Europeans, and the figures for oxaluria among the non-Europeans were actually not so high.

(5) The question of treatment is discussed briefly, and the effect of certain dietetic restrictions described.

My thanks are due to Colonel A. G. Wells, D.S.O., Officer Commanding the British Military Hospital (with Indian Wing), Mingaladon, for permission to forward this paper for publication, and to Jemadar Bhajan Singh, I.M.D., who carried out the majority of the urine examinations.

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THE LOG OF THE "SEABIRD" OSPREY.

BY MAJOR E. F. W. MACKENZIE, O.B.E., M.C.

Royal Army Medical Corps.

(Continued from page 193.)

Nov. 29.—After a delightful swim at Bhatkul Bay, where the white capped surf was coming in clear and blue, I went for a sail in the afternoon. Rounding Karwar Head I was soon reaching down the eastern coast of Anjediva Island. This pretty little Island lies about 3 miles SE of Karwar Head and its hills are covered with thick green vegetation topped here and there by tall palm trees from which the inhabitants no doubt obtain their "vitamins" at Christmas and on other festive occasions.

The eastern shore, where excellent bathing is to be had, is bounded by a sandy beach fringed by palm trees, but the western shore is formed of high dark cliffs on which the ocean swell beats ceaselessly. Although surrounded, except to seaward, by British territory and supporting only a handful of inhabitants, the island has remained in the possession of the Portuguese. There are only one or two isolated buildings and I am told that the representative of the Government receives the princely salary of Rs 25/- per mensem, but this may be an exaggeration!

I put out a natural bait, bangra, which is a small fish not unlike the English herring and excellent eating. Very soon I had caught a fish locally known as a bala. It had been hooked in the throat while trying to tear my bait off the tackle. This fish is long and flat like a strap and has no scales. When captured its skin is silver and shining with iridescent green and purple light like highly polished mother-of-pearl. It has a long mouth and in the front angle of the upper jaw are inserted four fearsome teeth, two on each side, long and curved like miniature sickles and quite as sharp. The local fishermen are much afraid of the bala for, as they sit in the stern of a canoe, he leaps at them from the water and sometimes inflicts severe cuts. I would not believe this story until I actually saw it happen last year when, coming home in the evening, the old man who steered my catamaran leapt into the bottom of the boat and had two nasty cuts each about an inch long and gaping across his shoulder.

On another occasion one missed him and leapt into the canoe causing considerable consternation amongst the crew until despatched with a piece of wood. I have heard locally a story of a helmsman who was dragged from a tony and drowned by a bala, but this also I shall not believe until I see it happen!

By 3 p.m. I was at Button Rock, three miles south-east of Anjediva, where last year the fishing was excellent. I sailed round and caught two

raus, each of which gave me a good run. The raus, or bahmins, is the Indian salmon and in appearance is very much like that of the Atlantic but has white flesh. It has the same habits of spawning in the rivers of the coast it frequents and is quite as game a fish as its western cousin though rarely, on this coast at least, running above 25 lb.

Off south-east again, past Aurigi Island and Cape Kawda Guda, a massive green headland, rising to over 700 ft. with good shelter behind it, and soon opening up Belikeri Bay. Then home close hauled on the star-board tack, a wet boat and a good breeze.

For the past week there has been practically no sea breeze, the wind shifting between NE. and SE. all day with only a short calm before mid-day. Newlands, of the Oyster Rock Light, tells me there is a storm out at sea which accounts for this and also for the absence of fish.

Enjoying the sail home this evening I suddenly realized that I was a long way out at sea, hungry, and that the breeze would soon fail as the sun was getting low, so I made for Karwar Head.

Approaching land a pall of cloud hung like a dome above the Ghats in the eastern sky and as the sun sunk lower, the light reflected from the now calm sea transformed it into a canopy of deepest orange changing to purple, where it met the pink sun-kissed peaks of the mountains. The sky was reflected in the sea, a flowing pool of changing colours. Catamarans, the naked brown bodies of their crews glowing in the dying light while one man standing in the bow of each gracefully cast his net, and two old country ships from far off Basra, painted in vivid colours by sunset's brush, stood out in sharp relief against the line of tall dark casuarinas that fringe the golden beach.

For an instant the clouds and sea became rose pink, and then changed to darkest purple and quite suddenly the light had gone.

One turned seawards to face the setting sun. Long clouds of flame were thrown across the sky, clean cut against the palest green of the clear dome beyond, and rising from a sea of molten flowing gold and blue, the wooded islands stood out in dark relief against the sky. In one burst of flaming glory the sun threw up his dying rays and darkness fell over the land and sea, pierced only by the flashing rays of the lighthouse for ever a warning to those who sail the seas.

Nov. 30.—A lazy day letter writing, making a spray shield for the sail home to Bombay, and rigging the boat to steer with an oar for a trip up the Kalinada river after crocodiles which I contemplate for to-morrow if my pilot arrives in time. I also had a very pleasant tea on board "Lot's Wife" and felt almost civilized again in the presence of a pretty pale mauve frock.

Dec. 1.—I was unable to get away this morning until 9.30 owing to the late arrival of my pilot. As a result I missed the first early morning breeze which I had expected to take me across the harbour in time to go up river on the last of the flood tide. After we had been lying in the bay

becalmed for an hour a breeze came, and having negotiated the entrance, we made a good beat up the river for about 8 miles, where the river narrows and rocks are added to the numerous sandbanks. By this time also the ebb was running strong, but with the assistance of my pilot I reached Bussingir, 10 miles from the entrance, without mishap. Here, my shikari informed me, is a large pool containing over 100 mugger—in fact a place where all good muggers go. We walked about two miles and found a small tank completely overgrown by water lilies and with banks entirely covered by thick vegetation. The chances of seeing a mugger before he saw me were very slender, and though I saw a small one put his snout above water, there seemed no chance of getting a shot at any. The place was very pretty—a haunt of many kingfishers, brilliant blue and orange, white under the wings, flashing from tree to tree. The whole river is somewhat remarkable for the number and variety of birds which frequent its shores.

I returned to the boat and set sail for a likely looking place I had passed on the way up and where I had seen one big crocodile, but failed to get a shot. I was anxious to try my new 9 mm. Mannlicker, from which I had not yet fired a shot. As we drifted behind an island on the tide we saw one lying well out on the bank. The anchor was dropped and the boat brought up all standing within about thirty yards of him. The movement of the boat made it look like a difficult shot, but the hair trigger of this rifle is of great assistance in pulling as one's sights cross the target and the only effort on the part of the mugger was a slight quivering of the tail.

We found that the bullet had entered beside his eye and blown off the top of his head. In half an hour I had another one, the whole front of his brain and head shot away. This is a powerful little weapon for its weight.

Having once skinned a mugger myself, I do not intend, unless driven by necessity, to repeat the operation, and having with me nobody skilled in the art, I, of necessity, set sail for Karwar and a flayer instead of spending a couple of nights up the river as I had intended to do. As we went down with a strong ebb tide and a head wind the sandbanks began to show up, and though the chart is very accurate, it is small scale, and I realized how hopeless it would be to attempt this river without local knowledge. In places the channel narrows to 40 or 50 yards with rocks or sand on either side and it became a race to make the entrance before dark. This we just managed to do, the wind falling light and a dead calm coming at 7.30 when well outside. A breeze came again at 9 p.m. and took us across the bay in the light of a full moon—a very beautiful sail. The muggers measure 11 ft. 6 in. and 10 ft. 4 in., a fair size for this district where they usually run small.

The sail up the Kalinada river is full of interest and unusually beautiful. About seven miles from the entrance the river begins to wind and one is soon surrounded by the foothills of the Western Ghats, heavily wooded, their dark green broken here and there by splashes of colour where trees

that shed their leaves are just assuming autumnal tints. At times the hills rise steep from the water's edge, then round a bend one comes upon a long stretch of sandy beach, a line of graceful palms, the wind turning the under surface of the leaves towards the sun, and villages dotted here and there, their thatched roofs showing brown against the green hills.

Occasionally the river divides and one works round a sandy islet with a few trees and a nest of fishermen's huts upon it. Here and there patches of irrigated land with tall crops of vivid green young sugar cane stand out brightly in the sunlight, and as the westerly breeze sets in the fleet of country boats comes surging up, their tall red-brown sails bellying in the wind, the white foam hissing from their bows.



Bartering grain for fish.

At this time of year the sprats and other small fish enter the river and many fishermen may be seen casting their circular nets from canoes loaded deep with a shining silver harvest.

Passing down the river in the evening groups of country folk are found bargaining, with much chattering and gesticulation, and bartering grain for fish.

Approaching the mouth of the river at low water one comes upon large groups of shell fishers, their heads and shoulders only showing above water, gleaning a meagre harvest from the mud and sand of the river bottom. Few means of gaining a livelihood from land or water are left untried by the natives of this district, and most men who are not skilled tradesmen can turn a hand to fishing, farming or shikari. All rejoice when a sahib arrives upon the scene and hopes rise high that days of ease may be gained by slight exertion.

The inevitable tales of cows killed only a few miles away by a tiger, of a panther which nightly steals the village dogs and which can be heard coughing in the jungle, fly from mouth to mouth and soon reach the ears of the sahib. A local shikari must be employed, beats must be arranged and if the sahib is innocent and new to the country no doubt the fortunate village of his choice grows fat and lazy for many weeks on the proceeds of his exploitation.

Dec. 2.—The morning breeze was very light and uncertain but a good sea breeze came from the west about mid-day, which is as things should be.

I went off on a beat out to Oyster Rocks. When nearing there the wind northered and I stood straight out to sea for about ten miles until the coast from Cape Ramas to the Tadri River was in view, a long blue shadowy stretch of forty miles of mountain peaks.

Then came a run home with spinnaker set, arriving just in time, as the breeze fell away soon after I picked up my mooring.

Although I put out a spoon I touched nothing. Even the local fishermen are catching nothing in their nets, so to-morrow I intend going up the river again to spend a couple of nights. This time I shall take a flayer with me, which will mean in all probability and in accordance with the perversity of fate that I shall shoot nothing.

Dec. 3.—I left Karwar at noon and got across the bay on the last of the land breeze. When off the river mouth this fell and the sea breeze came at once. Away we went, bowling up the river with a foul tide but a fair wind, in company with many country craft who easily outsail "Osprey" on a run without spinnaker, but whom she can outsail very easily to windward. I allowed them to guide me through the intricacies of the channel since, from their size, it appeared that they must draw more water than I do. This is not a safe assumption for, with my centre board down only enough to give me warning of danger to my rudder, I touched one sandbank which a large country boat had crossed and sheered off just in time after getting up my centre board a few inches.

We did not arrive at the mugger creek until almost dusk and though I got two shots from a rocking canoe, I bagged nothing. One big fellow I hit in the head but he got into the water and the other I fired at while moving and almost in the water—a foolish shot. I should have left them alone until to-morrow.

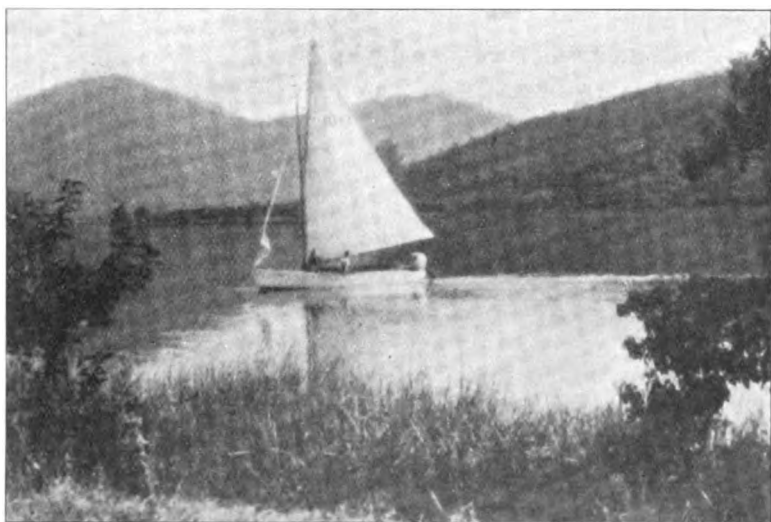
I have anchored in a large expansion of the river about two miles long and completely surrounded by a circle of high hills, a peep of the Ghats showing here and there through the gaps.

Dec. 4.—I sat on deck last night after dinner and long past my usual bed time to see the moon rise over the hills. The sky was cloudless, the polished surface of the water threw back its reflection to every star. Slowly the sky grew lighter, all but the brightest stars began to fade and above the hills appeared the moon, true gold in colour, her clear surface cut for a moment by one solitary palm, throwing a path of gold from the

dark hills across the water to the very stem of "Osprey." For a long time I sat lost in the beauty of the water and the light and shadow on the hills, ever changing as the moon rose higher.

Then I remembered I had planned an early morning and must to bed.

Dec. 5.—This morning I went for a walk up a tributary of the Kalinada, a very pretty stream running down from the hills through the jungle and still carrying plenty of water. On returning about 11 o'clock I again went in search of mugger in a canoe but saw only one just climbing out of the water. The presence of the canoe caused him to change his mind. With the afternoon breeze up river the fleet of boats arrived and I followed behind them, anchoring at dusk on Gootygal, fifteen miles from the



Up the Kalinada River.

entrance and as far as I cared to go since rocks were becoming too numerous for even a sporting chance of not hitting one sooner or later, especially as, on this occasion, I relied on my knowledge of the river gained on my previous trip and took no pilot.

At Gootygal we were in the very heart of the hills and though I did not wait up for the moonrise I was up several times during the night to protect "Osprey" from destruction by country boats. The night before we had been anchored off the main channel, which was a wise move and saved us from disturbance.

The quietness of last night was frequently disturbed by raucous song and much shouting and splashing. Soon a shadow would loom in the distance, slowly taking the form of a large boat rowed by eight or ten oars manned by lusty blacks and throwing one's thoughts back to the days of slave galleys. The speed they travelled at was remarkable and each and every one made straight for "Osprey's" riding lamp until my stentorian tones

proclaimed the presence of a sahib, when sudden silence fell, the boats were stopped and carefully taken in to the landing place.

It was not until morning that I realized that I was anchored exactly opposite the landing stage and that my riding light was probably mistaken for a lantern displayed by somebody waiting for the boat and a passage up the river.

We survived the onslaughts of these craft and this morning dropped down stream under foresail to Sidurh and another unsuccessful search for mugger. Then on in the afternoon with a nice breeze and a beat through the lower reaches of the river, arriving home in time for a late tea and a swim before dinner.

The three days up the river, though unsuccessful from a sporting point of view, were most enjoyable, the only unpleasantness being caused by swarms of small green flies which were attracted to my lamp.

This nuisance was largely mitigated by hanging it from the boom instead of from the crutch, which is its usual place, and I still had light enough to read by.

Steering with an oar lashed to a stout bamboo was successful except when before a strong breeze, when the boat took control. Under these circumstances I set the foresail only and this was sufficient to take her against the tide, though somewhat slowly.

Dec. 6.—A lazy day spent bathing and lying in the sun. I did not sail to-day as the tindal was hard worked up river and looked a little part-worn when he came for orders this morning.

Dec. 7.—A beautiful dawn and a cloudy morning with a stiffish breeze off shore, white heads showing all over the bay.

At about 11 o'clock I went fishing but the breeze increasing until a full mainsail was almost more than enough canvas, I took in my spoon and had the best sail since arriving at Karwar. I twice ran out of the bay and beat back, then out beyond Oyster Rocks and down the coast to Anjediva Island with a long beat home again, arriving just as the sun set and the breeze fell away.

Once again after a cloudy day the sea breeze failed entirely, the easterly breeze holding all day.

"Lot's Wife," "Sea Hawk" and "Pelican" large country-rigged three masters on government service have all arrived in port and the cove looks very yacht-y.

Dec. 8.—To-day I sailed down the coast and put out a spinner but touched nothing until coming home in the evening and several miles out to sea, when I hooked and landed a surmai of 10 lb. evidently a lonely fellow as no more came to my spoon and I saw none leaping.

This one gave me a good run for a small fish and jumped several times, though fighting near the boat and never taking much line.

An old Bombay friend of mine arrived to-day and we propose visiting Anjediva Island to-morrow.

Dec 9.—We sailed to Anjediva Island on a light breeze from SW. which held all day until it fell flat calm at sunset.

We explored the whole island and as I was barefooted I suffered somewhat from thorns and the heat of the rocks.

This Portuguese island is most interesting. Although now almost without population, it retains many relics of the days when it was a pirate stronghold and the starting point of many expeditions, legitimate and otherwise. It is said to have been garrisoned at one time by a force of over 2,000 soldiers and to have been considered impregnable.

Around the eastern shore above the beach and on the other sides along the edges of the cliffs, can be seen the remains of strong fortifications and



Bhatkul Bay from Anjediva Island.

in one projecting bastion on the north-east corner of the island we counted over twenty cannon lying, each in its own embrasure, as though left there when last fired and fallen to the ground when its carriage rotted and fell to pieces.

Well made roadways of flagstones, about six feet wide and walled on either side, wind up the hillside from the ruins of the main gateway on the eastern shore and at the hill-top traces still remain of stone pathways leading to the various forts and gun emplacements, which were doubtless used for carrying ammunition and supplies to guns and troops.

Beneath the ruined gateway lies a large flat stone, probably the centre piece of the archway, bearing a long inscription still legible though becoming obliterated by exposure.

A short way up the hill on the left of the road stand the ruins of what appears to have been the commander's house. The walls are solidly built

of stone and quite intact while at one end of the terrace, beside a neglected well, stands a loop-holed stone sentry box.

On the seaward side of the island every bay is commanded by stone redoubts built on the very edges of the cliffs, the old guns still lying in their embrasures and placed in such a manner as to bring cross-fire on every landing place. From the main fortifications on this side of the island steps cut in the solid rock of the cliff lead down to a spring which issues from a cleft in the rocks, giving a plentiful supply of good pure water, of which we drank eagerly. One's thoughts went back to the times when slave girls, captured in raids on the neighbouring coast, swung gracefully down the hillside, brass pots balanced on their heads, to carry water to the soldiers.

On the eastern slopes of the hills, sheltered from the onslaughts of the south-west monsoon, are the remains of buildings which probably housed the garrison, but these, being less solidly built than the Captain's house, consist merely of piles of stones showing where the walls once stood.

The whole island was evidently at one time highly cultivated and almost every earthy slope had been terraced for this purpose, though now overgrown by bushes or coarse grass.

The water of the bay is very clear and deep up to the edge of a beach of clean yellow sand ; as tea-time had not yet arrived when we returned I took advantage of the opportunity to scrub off the growth which three weeks of tropical waters had deposited on "Osprey." We set to work with large pieces of cotton waste and by taking a deep breath and pulling oneself underneath the boat it was quite easy, lying on one's back in the clear water, to see her bottom and scrub her clean. In half an hour, with three of us at work, she was almost as clean as when she left the dockyard and coming home in the light breeze she was much less sluggish than when going out.

After this somewhat strenuous labour we were quite ready for tea and great was the rejoicing when steam issued from the kettle.

(*Note.*—Some time after my return to Bombay I saw a report on graves of British soldiers who were buried on Anjediva. It appears that some two hundred died there of plague. Although the graves were reported to be well cared for I saw no sign of them, nor did there appear to be any place where they could have been unobserved unless considerably overgrown.)

The breeze remained light all the afternoon and fell dead calm with sunset, causing us to paddle for the last mile home. We were more than compensated for the lateness of our arrival by the beauty of the sunset, the western sky being covered with golden scales of cloud like glistening armour, and later, when it grew dark, by the phosphorescence of the water, every stroke of the paddle causing pools of silvery light, and the tracks of small fish glittering in the darkness as they fled from "Osprey's" bows.

There has been much heavy cloud to-day and the breeze has been very light, variable and off shore all day.

The clouds over the hills look ominous to-night and to-day we saw some heavy showers in the distance and one very brilliant rainbow.

Coming home we saw large shoals of sprats in the bay, which, if they stay and the weather settles down, will mean the near arrival of the big fish. This is the first promise of sport I have seen since arriving but, though unusual in December, it looks very much as though a storm is coming.

Dec. 10.—During the night there was some rain and this morning, though the breeze was light, ominous clouds hung over the mountains and many large country craft had anchored in the bay for shelter. After last night's promising indication I felt I must try for a fish, but leaving the bay the wind came and away I went, so fast that I could not keep my spoon in the water so gave up fishing.

In a few minutes white horses were racing across the bay as I beat up and ran out to sea again for another beat. When half way back a squall carried away my jib. Seas were getting up, and as water was already showing above the floor boards I was glad to run into the shelter of Bhatkul Bay to repair damage, and reef. The sail home was a stiff one and a dead beat after rounding Karwar head.

Dec. 11.—The wind increased to half a gale last night, one large country boat being capsized in the river and another blown ashore. Clouds of dust obscured the cove, and I frequently went out to see "Osprey" who rode it out safely to two anchors. I dined at a bungalow on the hillside, the pathway to which was obstructed by trees blown down in the night.

During the afternoon I saw large surmai leaping in the bay, and it is most unfortunate that this storm has put fishing out of the question and will probably drive them away again.

The morning was calm with a light breeze from SE., and I got off early, but within ten minutes the breeze was freshening and I reefed right down.

I ran out of the bay but it would have been hopeless to attempt to run a fish in the wind and sea, so I packed up my rod and beat for home.

It looks more promising now and I have hopes for this evening.

(To be continued.)

A PORTABLE STEAM DISINFECTOR WITH IMPROVISED INSULATION.

BY CAPTAIN E. BABER,

Hygiene Officer, South African Medical Corps.

A DESIGN for a suitable type of portable steam disinfector for use in the field, under conditions likely to arise in southern Africa, was recently devised and tested by the Hygiene Section S.A.M.C., Roberts Heights, Pretoria, where various experiments were carried out.

The following is a description of a simple and effective steam disinfector which has been evolved. It embodies well tried principles; but it has been particularly designed so as to produce a maximum of steam and to prevent avoidable loss of heat by a method of improvised insulation. Further, and in view of the paucity of fuel obtainable in many areas of the high veld, the employment of an oil-burning type was considered most suitable to the conditions.

It was considered that, basically, the disinfector should be such as to produce a large volume of steam which could be maintained continuously for some hours, even in exposed places and in the presence of cold winds. Within twenty minutes from the commencement of disinfection a temperature of boiling point should be reached inside at least fifteen layers of Army blanket, as shown by a thermometer wrapped therein. The fuel required should be easily transportable, inexpensive and easily obtainable. The entire apparatus should be capable of being constructed by a semi-skilled man from material obtained locally, should be reasonably portable under field conditions, and capable of being erected and brought into operation in not more than two hours.

The primary requirements for this disinfector are two forty-five-gallon oil drums. These drums are freely obtainable in South Africa at a cost of a few shillings, and measure 37 inches in height by 22 inches in diameter. The top of the drum is cut out with a chisel and the piece removed is provided with three legs, which are made from strip iron and are riveted to the disc so as to give it a height of 5 inches. Holes are punched in the disc to permit escape of steam. This arrangement is placed inside the drum and forms a false bottom above five gallons of water (*see figs. 2 and 9*).

The drums need to be provided with close fitting metal lids. The rims of the lids fit outside the drum and are required to be of such size as to permit the rim being lined with thick felt, secured with rivets; the under side is lined with old blanketing. Well fitting lids are important; without them there is likely to be considerable loss of steam.

A combustion chamber, or pit, is a feature which is essential to the use

PORTABLE STEAM DISINFECTOR.

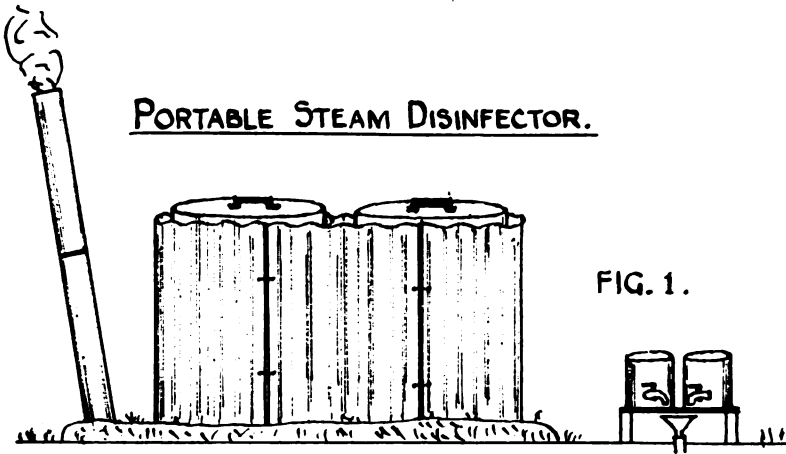


FIG. 1.

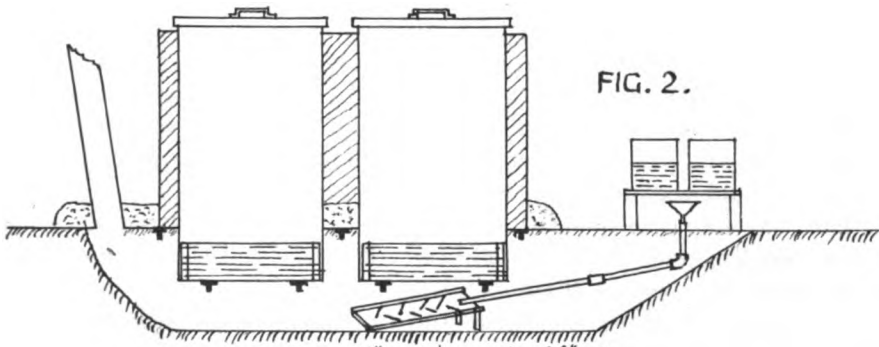


FIG. 2.

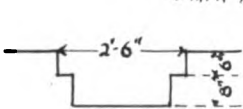


FIG. 3.

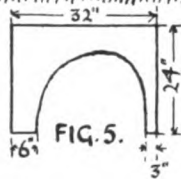


FIG. 5.

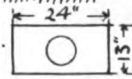


FIG. 8.

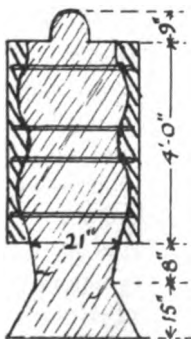


FIG. 4.



FIG. 6.

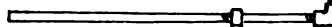


FIG. 11

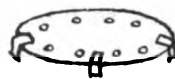


FIG. 9.

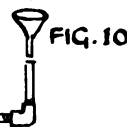


FIG. 10



FIG. 12.

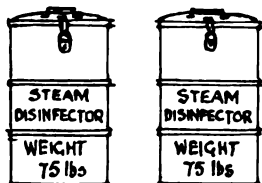


FIG. 7.

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of the apparatus. The pit is 4 feet long by 2 feet 6 inches wide at the top, and is stepped in at a depth of 6 inches so as to form a benching to carry the iron bars which support the drums. The earth is cut away from the benching in a semicircle to allow flames from the combustion pan to encircle entirely the lower ends of the drums. At the front of the pit a sloping access pit is cut ; and, at the rear, a cutting is made for the chimney (*see* figs. 3 and 4).

To erect the disinfector, the two drums are placed in the pit, each supported by two iron bars thirty inches long resting upon the benching. The next step is to cover the pit at ground level. The covering is made from pieces of corrugated iron beaten flat and cut as shown in fig. 5. Four pieces of iron are required. When cut they measure thirty-two inches by twenty-four inches and are shaped so as to fit around the drums. These four pieces, together with the small cover piece into which the lower end of the chimney is placed (*see* fig. 8), are supported by three iron bars, each thirty-six inches long, which are placed across the pit at ground level.

The drums are now completely surrounded at a distance of three to four inches with corrugated iron sheets. Six sheets are required. These are cut to a length of thirty inches and, when erected, are secured, in a simple manner by small pieces of wire passed through holes punched in the edges for the purposes (fig. 1). Two chimney lengths are now placed in position and secured with wire.

The next step is to fill earth into the interspace between the drums and the surrounding wall of corrugated iron. Earth is also shovelled on top of the sheet-metal covering of the combustion chamber and around the base of the chimney. Thus the drums and the combustion chamber are provided with protection against loss of heat. This is another essential feature of the device.

The combustion pan is made of sheet iron and measures 24 inches by 11 inches. The edges are turned up $\frac{3}{4}$ of an inch along three sides. Eight alternating baffles, each 6 inches long, are riveted in an oblique position in the lower 15 inches of the pan. These baffles serve to distribute oil-and-water fuel over the surface of the combustion pan as it flows slowly downward ; the pan is provided with two supporting legs (fig. 6).

A five-gallon drum, cut into two, provides receptacles for oil and water. These are fitted with small brass taps and the receptacles are placed upon a light metal frame (fig. 1). The taps discharge into a funnel and thence, by means of a length of iron piping, the oil and water are conveyed to the combustion pan. The pipe measures 4 feet 6 inches in length, the upper 3 inches being carried up at right angles. It is screw-jointed at 3 feet to permit of being disconnected and packed in the drum for transport (fig. 11).

All of the material used in the construction of this disinfector, with the exception of the two drums and the taps, was improvised from odds and ends discarded by the Public Works Department.

Waste motor oil obtained from the South African Air Force workshops

was used as fuel. This is a mixture of discarded oils from aeroplanes and motor lorry engines. The oil and water from the taps of the receptacles are caused to drip slowly into the funnel. A fire is started by means of a piece of tow or waste which is soaked in the oil, thrown upon the combustion tray and ignited. After the lapse of a few moments the oil-and-water mixture, discharging from the pipe upon the upper end of the combustion tray, takes fire and burns fiercely. It is necessary to adjust the flow of oil and water so as to obtain a good steady fire with a minimum of black smoke; with an excess of oil there is much black smoke, whilst an excess of water puts the fire out. Correct proportions will give less smoke and more heat. Adjustment of flow requires a little practice. It was found that an excellent fire was maintained with an expenditure of one quart of oil per hour.

The nature of construction of the combustion chamber is such that a good draught from front to rear is obtained and very little fire or smoke emerges from the front. The combustion chamber is designed to permit flames almost entirely to surround the lower end of both drums resulting in a maximum use of the fire with a minimum loss of heat. Steam is evolved in an average time of twenty-five minutes after igniting the fuel.

The capacity of the drums is twelve Army blankets each. Tests were made with twenty-four blankets which were packed firmly into the drums but without being pressed down. It was found that steam begins to emerge from beneath the rim of the lids in eight minutes after packing.

Temperatures were observed, as recorded by a thermometer placed within the top blanket but one, and well wrapped around. Other tests were made with the thermometer completely wrapped in from fifteen to twenty layers of blanket. A temperature equivalent to the boiling point of water was consistently recorded in each case.

The tests were made at Roberts Heights, which is situated at an altitude of 4,775 feet above sea-level, and a correction of $8\frac{1}{2}^{\circ}$ F. was necessary.

Temperatures and times taken were as follows :—

		20 min.	15 min.	10 min.	5 min.
Actual temperature recorded ..	..	203.5	202	200.5	194
Corrected for altitude ..	..	212	210.5	209	202.5

An egg wrapped inside the top layer of blanket, that is, in the twelfth blanket, was found to be boiled hard when opened after a lapse of ten minutes.

These temperatures were compared with those obtained with the Improved Serbian Barrel disinfecter, which employs downward displacement of steam. The drum disinfecter herein described compared more than favourably.

This two-drum disinfecter, with all necessary parts, false bottom, corrugated iron surrounds, coverings for combustion chamber, oil and water receptacles, etc., which all fit easily into the two drums, has a total weight of 150 pounds, consisting of two drums each of 75 pounds. The

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covers can be fitted with fastenings and padlocks for use when transported.

The men of this Section indicate that they would far sooner have this disinfector when doing a disinfection job than any other portable type tried here. They regard it as easier to handle and able to produce and maintain a larger volume of steam.

The tests made of this disinfector leave no doubt but that the apparatus is of practical application in cases where an efficient, improvised, portable disinfector is required. The fact that it burns oil fuel permits of it being used in places where no wood or coal is available. A five-gallon drum of waste motor oil furnishes sufficient fuel for forty hours' working.

These experiments and tests were carried out at the suggestion of Colonel E. H. Cluver, Director of Medical Services, Union of South Africa, to whom the writer is indebted for his interest and for permission to send this description for publication.

A TERRITORIAL FIELD AMBULANCE "AT HOME."

BY LIEUTENANT-COLONEL J. KINNEAR, T.D.,

Royal Army Medical Corps, T.A.

THE following brief account of a successful "At Home" held recently by the 152nd (Highland) Field Ambulance, T.A., is written in the hope that it will be useful to others who intend to run similar shows and encourage those who have not thought of holding an "At Home" to do so.

Besides being a part of this unit's contribution to the local Coronation celebrations, the "At Home" was intended to give an opportunity to the public of seeing what a Field Ambulance is and what it does (ignorance of answers to these two questions is not found outside the Service only).

The preparation for the "At Home" was also excellent practice for the personnel of the Field Ambulance, and many of the exhibits have been carefully preserved for use in future training. Fortunately the recruiting question did not form a factor in our object as we are nearly 10 per cent. over our establishment.

"At Homes" held in the depots of "Regular" units were taken as a guide and modified to suit local conditions. This unit shares with two others a block of buildings, including a smaller and larger hall with a parade ground in front. They are situated near the centre of the town. The use of the whole of the premises for the day was obtained and the local press gave us the courtesy of their columns for publicity and notices were also inserted in the advertisement pages a week before and a day before the event.

This unit boasts of an excellent pipe band which was an invaluable help to the proceedings. 3 p.m. on a Saturday afternoon was the time fixed for opening the doors, but the crowd commenced to roll up a quarter of an hour before that and interfered with last minute touches! The first hour was given to an exhibition in the smaller hall. The exhibits were arranged round the hall, prominently lettered, A, B, C, D, and so on, and 500 four-page descriptive programmes had been "duplicated" and were distributed at the door.

The exhibition began with a large chart (modified from R.A.M.C. Training) showing the scheme of evacuation in the field, each stage being represented pictorially. Then came a complete set of model mechanical transport of a Field Ambulance, followed by models of an R.A.P., A.D.S., and M.D.S. The dug-outs lit by electric light proved attractive, especially to the younger members of the audience.

The next part of the exhibition dealt with the treatment given in a Field Ambulance, emphasizing its simplicity and its necessity before

evacuation. Methods of dealing with fractures, hæmorrhage and shock in the field were all shown, including X-ray films in a home-made but effective viewing box, demonstration on all who cared to try it of how a tourniquet can obliterate the pulse, and the warming of a collapsed patient as described in para 231 of R.A.M.C. Training. The Dressing Section followed and showed the apparatus for giving morphia and anti-tetanus serum as well as a display of operation instruments, which attracted as large a crowd as any exhibit. Ward equipment was represented by bed, pyjamas, etc., and the methods of recording casualties and dealing with their equipment were also shown. The next section dealt with Chemical Defence and, in addition to charts and models of a complete decontamination centre, showed past and present types of respirators, including the civilian type, and gave anyone who cared an opportunity of trying on a respirator. Finally a "museum" brought one back to the door of the hall. Photographs of the unit and its commanding officers since 1908 and large scale war maps of France with a list of actions in which the unit took part during the Great War with ribbons leading from the name to its site on the map were very popular with former members of the unit. Among other exhibits a number of lantern slides were on view, lit from behind, showing the evacuation of casualties from the front line to the home hospital and other views of the unit in past years.

After leaving the hall the visitor could see the "hospital kitchen" where tea and bully beef sandwiches were available, and inspect the transport we actually have. Our new Motor Ambulance Car was much admired.

Towards 4 o'clock the pipes and drums drew the crowd towards the larger hall where a display was staged accompanied by a running commentary from a loud speaker. Stretcher carrying was shown, first the right way and then the wrong, which ended in the wounded man being tipped over a "wall", stretcher and all. Recruits then gave a very good demonstration of hand seat carriage. An "air raid" was staged with a gas sentry who was injured by a gas bomb and had to be dealt with by a man in full protective clothing and removed by a squad wearing respirators. Thomas's splint drill followed and the display ended with a very successful sketch written by one of the officers.

The organization and preparation for the "At Home" took considerable thought and work. Each officer was allotted a certain part for whose arrangement he was responsible, and each section of the exhibition was in charge of an N.C.O. who could explain and answer questions. A very worrying point was how many visitors to expect; we estimated five hundred or so but were prepared to deal with more and even to duplicate the display if necessary. Actually about one thousand turned up which rather taxed the accommodation of the hall but did not overwhelm us. About ninety officers' guests accepted invitations. They were asked to bring their invitation cards with them in order that they might be "received" in the Officers' Mess. It would have been better to have

asked them to show the cards at the door, as many kept them in their pockets and were shepherded straight into the hall with *οἱ πολλοί*. While the display was going on the smaller hall was cleared and refreshments provided for the officers' guests at the close.

Expenses (including over £3 for advertising) came to between £9 and £10, not an excessive figure. The public seemed very appreciative and the unit had a good "polish up" in its duties, including the problems of dealing with an unknown number of "casualties" to put through a Field Ambulance!

I should like to take this opportunity of thanking Colonel P. S. Lelean, C.B., C.M.G., F.R.C.S., F.R.S.E., Professor of Public Health, University of Edinburgh, who lent some anti-gas equipment, and Miss Nairn, Ashbank, Dundee, who lent some excellent models of decontamination centres which she had made herself.

I have to thank Colonel G. F. Dawson, M.C., D.D.M.S., Scottish Command and Colonel W. A. Robertson, M.C., A.D.M.S., 51st (Highland) Division, for permission to send this article for publication.

MASS TREATMENT OF ORIENTAL SORES.

BY MAJOR F. HOLMES, O.B.E.,

Royal Army Medical Corps.

BALUCHISTAN is an area in which oriental sore is endemic. It is a condition which occurs in waves according to the prevailing climatic conditions. In Quetta the conditions were very favourable, following the earthquake, for the breeding of sandflies. At the beginning of 1936 an epidemic of oriental sores arose, and 623 cases were treated among British troops, Indian troops and families. The dogs, as is usual where oriental sores are endemic, were heavily infected. Their lesions were about the nose, eyes, lips and ears. Many of these were easily missed unless specially looked for.

When it was realized that oriental sores were prevalent they were particularly looked for on the routine monthly inspection, which included troops, private servants and followers. The dogs were also occasionally inspected.

The diagnosis was easily confirmed. The ulcer or nodule suspected was cleaned up with spirit, and a puncture made with a straight skin needie about one-eighth inch from the edge, and serum expressed, the third drop being used to make a smear in the same manner as a blood film. When sepsis has supervened a negative result invariably follows, so a clean nodule or ulcer should be selected for examination.

The routine treatment adopted was ruthless curetting with a Volkmann's sharp spoon under gas, followed by free cauterization with pure carbolic acid. It cannot be over-emphasized that the curetting cannot be too thoroughly done, even on the nose, lips and face. The scarring left is almost negligible. The discoloration round the edge gradually disappears. Besides the heaped edge of the ulcer the base should also receive attention.

A few chronic ulcers in which Leishman-Donovan bodies were not found were scraped. After some experience it became obvious that these were not oriental sores, as they were fibrous and painful when scraped, and the patient tended to move even though under gas, while the oriental sores were softer and not fibrous, and came away rather as a cheesy mass leaving a hole one-eighth to three-sixteenth inches deep which was rapidly filled up again. There is no tendency for the patient to move while under gas, so apparently they are not as sensitive as ordinary chronic ulcers while being scraped. After scraping and cauterizing, the wounds were covered up directly with elastoplast and left covered for two weeks. They healed in two to three weeks, those which remained fairly dry healing in two weeks, and those which exuded serum or blood taking three weeks.

Two cases relapsed. Leishman-Donovan bodies were present on re-examination, and being early cases were probably insufficiently scraped in the first instance. The case which is apt to be insufficiently scraped is the officer, officer's wife or child, not the soldier. One officer with face lesions, who did not wish to have gas, was done under local anæsthesia without success.

Quite a number of small and even large ulcers were treated successfully by the application of pure carbolic acid alone on alternate days for three or four applications.

Berberine sulphate $\frac{1}{4}$ grain in 1 cubic centimetre of sterile water was injected around and into several ulcers. It is only useful in the papular stage in small ulcers. It is a painful treatment and rather a waste of time if many cases or many ulcers have to be treated.

An alternative method was tried : after scraping tannic acid was dusted into the wound with the idea of acting as a styptic. The wounds healed just as well, but took seven to ten days longer, i.e. three to four and a half weeks.

With a view to economy sterile vaseline on gauze was used as a dressing in place of elastoplast. The vaseline stopped the dressing sticking, but the wound would not heal completely even in two or three months, unless the vaseline dressing was discontinued because it caused exuberant granulations. If the wound was left exposed to the air or was dressed with any antiseptic it would heal. Eusol caused irritation and kept the wound open. We actually used a watery solution of acriflavine.

Forty-eight cases were treated, in addition, with a trivalent antimony compound—sodium antimony tartrate—in sterile water by intravenous injection commencing with $\frac{1}{4}$ grain dose increasing by $\frac{1}{4}$ grain every alternate day up to $1\frac{1}{2}$ grain or $1\frac{3}{4}$ grain dose, according to the tolerance of the patient to the larger doses. At first the dose was given in 10 cubic centimetres of sterile water, and later under 1 grain in 4 cubic centimetres, and over 1 grain in 6 cubic centimetres, but it made no difference to the reaction, which was never great even after the larger doses. British other ranks appear to stand the larger doses better than the Indian other ranks : 10 to 15 grains were given according to the severity of the case. The cases selected for the combined treatment—scraping, carbolizing and sodium tartar emetic—were those with extensive lesions on the face or very numerous general lesions. At first we dissolved the tartar emetic in 5 per cent glucose solution, but found it quite unnecessary as sterile water gave no greater reaction. One thing noticed about the combined treatment was that the discoloration around the edge of the ulcer disappeared quicker with the combined treatment than after the scraping and carbolic acid alone. In either case the discoloration finally disappeared. One case developed keloid in one of the scars.

Two pentavalent antimony compounds have been tried, but they do not appear to be of any use in skin leishmaniasis.

The maximum number of sores on one patient dealt with at the same time was sixty. There were never any signs of carbolic acid poisoning. The maximum number of sores occurring in any one case was 164.

The routine adopted was to have the cases from the units paraded twice weekly at the minor operation theatre for treatment. Later each medical officer treated the case occurring in his own unit in the same way.

Cases were treated as out-patients, whether by curetting and carbolizing or by the combined treatment with antimony injections.

It was striking how few cases occurred on the faces of women. It has been suggested that the use of cosmetics by them discouraged or prevented the sandflies from biting. Those who were infected were obviously the type who did not use cosmetics.

It is however noticed that girls and boys suffered in the same manner as the troops in regard to face lesions.

It has further been suggested that the early treatment of cases may have prevented immunity developing. As most of the units have moved it is impossible to give an answer to this suggestion, but considering the slow development of the nodule and ulcer, it is more than likely that immunity has ensued before they seek advice or are discovered.

Twelve of the infected dogs were treated with 20 per cent copper sulphate in 5 per cent carbolic acid. The application was made on four successive days, and according to the severity of the case repeated in seven to ten days for one day, and if necessary seven to ten days later for one day, i.e. six applications in all. The ulcers were healed in one month. We treated these cases as a matter of interest and were not usurping the duties of the R.A.V.C. and I.A.V.C.

CONCLUSION.

(1) The best, cheapest, quickest and most convenient method of treating numerous cases of oriental sores is thorough scraping of the ulcers or nodules under gas followed by the application of pure carbolic acid, the whole area being then covered by elastoplast, which is left in position for two weeks, or renewed if it comes off or is removed for any reason.

(2) Trivalent antimony compounds, either alone or in combination with the above, are effective in treating oriental sores.

Pentavalent antimony compounds did not come up to expectation in the treatment of skin leishmaniasis.

Editorial.

PREVENTION OF TYPHUS FEVER.

In the Bulletin of the Health Organization of the League of Nations, vol. vi, there is an article dealing with the "Prophylaxis of Typhus Fever and Vaccination against that Disease." The introduction to the article has been prepared by Dr. Y. Biraud, of the Health Section. He points out that the persistence of typhus fever endemicity, after the huge epidemics which occurred at the end of the War in eastern Europe, and its marked prevalence in the last few years, not only in Europe but also in Africa and South America, as a result of the economic depression, made it clear to the health authorities that the classical measures of "delousing" during epidemic outbreaks are incapable of eradicating the disease in areas where it is endemic.

Fresh researches on the epidemiology of typhus which have been made lately have thrown considerable light on the subject.

These researches are stated to have shown :—

(1) "The existence during epidemics, apart from obvious cases of typhus, of atypical or subclinical cases, or, indeed, of individuals with latent infection."

(2) "The persistence in certain cases of the infection without symptoms for several months after the disease."

(3) "Finally, the appearance or re-appearance of the disease after years of latency in a certain proportion of individuals."

It is noted as regards (1) and (2) that "even if these individuals do not transmit infection to the lice which they carry, their blood proves virulent when inoculated to the guinea-pig or to man, which shows that it does contain the typhus virus."

Dr. Biraud considers that these observations justify the conclusion that typhus fever is a premunizing infection—that is to say one in which immunity depends on the presence of the germ in the body. He says that this new conception of typhus infection makes it easy to understand that owing to insufficient feeding or excessive fatigue the immunity balance of an individual formerly infected with typhus may be upset. The virus then liberated invades the blood-stream, induces the symptoms of the disease and may transmit infection to lice carried by the individual. This explains the recrudescence, apparently spontaneous, of old typhus in places where the population remains infected with lice in spite of the disappearance of the disease during the inter-epidemic period.

It is obvious from these considerations that to render harmless the re-appearance of the typhus virus, the population must be kept free from lice. This is stated to be the case in American cities where the late relapses of typhus (Brill's disease) are not followed by secondary cases owing to the absence of lice necessary for transmission.

The classical method of delousing while temporarily ridding the population, stricken by an epidemic, from their parasites, does not protect them against a more or less rapid return of louse infestation which is related to complex social and economic conditions. These cannot be modified without great expenditure often beyond the resources of local authorities.

In such circumstances an effective method of vaccination against typhus would be of great value to sanitary authorities.

Unfortunately the preparation of a vaccine presents unusual difficulties, as *Rickettsia prowazeki*, now regarded as the causal germ, cannot be grown on ordinary culture media. Attempts to use as an antigen the killed germs contained in infected organs have failed, probably owing to insufficient numbers. Weigl, culturing *Rickettsia* in the intestines of lice, was the first to obtain them in sufficient quantity to induce immunity in man with killed germs. The delicate manipulations required make this method expensive and applicable only to small groups of persons particularly exposed to typhus infection.

Recently the study of murine typhus has opened a new avenue to the solution of the problem.

The virus of murine typhus, which inoculated to man produces only a transient fever with comparatively light nervous symptoms, has proved capable of inducing a strong immunity to both the murine and the classical forms of typhus.

Blanc, by submitting to the action of ox bile the organs of guinea-pigs infected with murine typhus, succeeded in rendering the virus they contained incapable of producing symptoms when inoculated to man. This biliated vaccine has been used in Morocco.

Laigret, Roger Durand and Joseph Belfort have made 4,000 vaccinations against typhus in Tunis and in Algeria, employing, like Blanc in Morocco, a living murine typhus virus. The virus they have used is the *virus* "Port I" that Helène Sparrow isolated from the rats in Tunis port in November, 1933. It had undergone 125 passages from rat to rat and after some changes in virulence acquired the characters of a fixed virus for the rat. It had a high virulence for rats, produced a short fever, but did not kill them. In about half the inoculated rats a Weil-Felix reaction was obtained towards the end of the febrile attack.

Laigret and his co-workers at first dried the virus in the presence of phosphate of soda, emulsified it in egg-yolk and then emulsified it in olive oil. They point out that the virus is living and its vitality is controlled by intra-peritoneal inoculation of test animals. The double emulsion in egg-yolk and then in olive oil is important and renders the method perfectly innocuous. The vaccine, as prepared in the Pasteur Institute of Tunis, is in the form of a powder. When employed the vaccine is ground up in olive oil delivered in sealed tubes at the same time as the vaccine. One cubic centimetre of the oily suspension is injected in the region of the shoulder blade. The injection is not painful and with the usual aseptic

precautions there is no local reaction. Two injections are given to Europeans, the first containing $\frac{1}{200}$ part of the virulent brain of a guinea-pig and the second, given twenty-days later, $\frac{1}{200}$ part of a virulent brain from a rat. The guinea-pig's brain contains less virus than that of the rat so that by employing these two injections the process is more gradual. For Arabs as a rule only one injection is possible and for this rat's brain is used.

In a preliminary campaign, carried out with this vaccine in 1934-1935, Laigret vaccinated 135 persons in Tunis who had been in contact with typhus cases. Each received two injections, the first containing the guinea-pig virus and the second the rat virus.

In 1935-1936 there were 3,429 new vaccinations in Tunis, and 821 in Algeria. Half of the vaccinations were carried out, as in the preceding year, in centres of infection on persons who had been in contact with the sick. The other vaccinations were practised in non-epidemic periods in centres where typhus always appeared in the cold weather. Vaccinal reactions were only observed on seven occasions. They consisted of short periods of fever without any rash or nervous symptoms. The Weil-Felix reaction became positive in the reacting cases; it was not found in the persons who had no reaction to the vaccine.

A few cases of typhus, infected before the vaccination, appeared in epidemic centres. Seven cases appeared in the course of the first week and one on the tenth day. When the vaccination was practised in two stages, two cases appeared after the first inoculation with guinea-pig virus. No cases of typhus followed inoculation with the rat virus after the seventh day.

A particularly demonstrative experiment was made during the epidemic at Sidi-Nacene. In an equal proportion of vaccinated and non-vaccinated cases during four weeks there were sixty-six cases of typhus among the non-inoculated, six cases among the vaccinated in the first week, and none later.

In other centres similar results were obtained though the cases were not so severe, and a short time after inoculation quarantine was removed among the inoculated persons.

Centres where vaccination was practised in the "cold", viz. in the absence of an epidemic (with the sole object of preventing the reappearance of typhus), are being kept under observation to see if they remain free during epidemic times. In Tunis three such centres, Hamira, Protville and Ghardimaon, which were vaccinated in the winter of 1935, have remained free from typhus, though it has broken out in areas around the centres.

Laigret states that the system of vaccination is now organized in Tunis and Algeria and the vaccine is available for the general practitioner. He considers that vaccination followed by delousing should in a few years cause the complete disappearance of typhus from the French North-African colonies.

Dr. Biraud states that while these large-scale vaccinations, with live

murine typhus vaccine, were being carried out in Algeria and Tunis, Zinsser and Castañeda were testing in Mexico the effects of a killed vaccine prepared from emulsions of *Rickettsia* developed on the tunica vaginalis of infected rats, the resistance of which was diminished by artificial means. But the delicate character of the technique prevented large scale application of the method. An attempt was made to obtain an immunity in man by the use of the serum of horses hyperimmunized with the germs obtained from the rats : but the immunity proved transitory.

An endeavour was made to obtain by tissue culture large amounts of *Rickettsia* for the manufacture of vaccine. Although *Rickettsia* have been grown successfully in tissue culture and also in the cells of live chick embryos, these methods are still in the experimental stage.

Following on an alarm concerning typhus fever among the fighting forces in Spain the Spanish Government asked the League of Nations for technical advice regarding measures for the protection against the disease.

A mission sent to Spain found no evidence of typhus there but a definite menace existed owing to the infestation of the troops with lice, the large number of refugees, and the possibility of the virus being brought to Spain from outside sources. Before giving technical advice to the Spanish Government the Health Committee of the League considered it necessary to convene a meeting of experts. They met in Geneva on the 8th, 9th and 10th of February, 1937.

The experts concluded that : "Living virus vaccines conferred an early protection whether by premunition (i.e., the form of immunity depending on the presence of the germ in the body) only, or by premunition followed by immunity."

They also considered that living virus-vaccine, provided it actually induced infection, conferred greater protection than that which can be conferred by the same virus when killed.

It was recognized that epidemic typhus so endangers the life of its victims and the health of the community, especially in time of war, that the risks attending vaccination with live virus were to be disregarded in the case of an epidemic.

In a country free from typhus, but where the disease was a menace, killed-virus vaccines were indicated because their use did not imply the introduction of a live virus into a country free from typhus and the risks attendant on such an introduction.

The experts finally recommended that in those countries free from, but threatened by typhus, vaccination of medical, sanitary and auxiliary staff should be performed with a killed vaccine ; while, if typhus broke out, mass vaccination of the population in the infected areas should be carried out with live virus vaccines.

While the experts agreed to these recommendations there was not complete unanimity among them in regard to the risks involved in vaccination with live viruses.

The biliated murine vaccine of Blanc was the subject of considerable discussion in this respect. It was reported to have been quite successful in Morocco, where it was applied to 35,000 people without reaction among the vaccinated, or secondary cases in their vicinity, and where endemic typhus disappeared in areas when the whole population had been vaccinated. Opinion was divided as to its innocuousness on account of accidents, some of them fatal, observed in Chile attendant on the vaccination of 550 people. No satisfactory explanation of the accidents in Chile was available. The fact that the mechanism by which the bile renders the virus innocuous is not understood raises fears of the possible return of virulence to the biliated virus.

There is no record of accidents beyond those already mentioned, following the use of the vaccine of Laigret. Still, when a live virus is employed it is to be feared that in persons who are peculiarly susceptible, or when resistance has been lowered by exhaustion or famine, the virus may regain its virulence and infect like the people carry. It must, however, be emphasized that all attempts to recover the virus through lice from individuals vaccinated with either the Blanc or the Laigret vaccine have failed.

THE NINTH INTERNATIONAL CONGRESS OF MILITARY SURGEONS AND PHARMACISTS.

THE Ninth International Congress of Military Surgeons and Pharmacists was held in Bucharest from June 2 to 10 inclusive.

These Congresses are held every two years in different countries, and apart from their main object of bringing forward for discussion numerous and various subjects of mutual interest to the Army, Naval and Air Force Medical Services, are also a means of bringing medical officers of all nationalities into closer union.

The social side of these Congresses has, indeed, always played an important part in the programme. The Congress at Bucharest was no exception to this now well-established custom. The actual work of the Congress is arranged by the Permanent Committee. The social activities are organized separately by the country acting as host.

Some fourteen hundred members from thirty-odd different countries met this year, and included members of the Red Cross and of the Sovereign and Military Order of Malta.

The British Delegation was composed as follows :—

Lieutenant-General Sir James A. Hartigan, K.C.B., C.M.G., D.S.O.,
Chief Delegate.

Colonel Wallace Benson, C.B.E., D.S.O., Member of Permanent
Committee.

Lieutenant-Colonel A. F. C. Martyn, R.A.M.C.

Surgeon-Captain H. E. R. Stephens, O.B.E., Royal Navy.

Among the Papers read were the following:—

- (1) Organization and Function of Medical Services in Combined Operations by Land and Sea—Lieutenant-Colonel A. F. C. Martyn.
- (2) Transport, Hospitalization and Treatment of Gas Casualties.
- (3) Organization and Function of Mobile Surgical Units.
- (4) The Edentulous in Armies—Definition, Treatment, etc.

Several meetings of the heads of the delegations were held at which the question of the constitution of the Permanent Committee was discussed. There was a desire that more countries should have representatives serving on it.

Up to the present seven countries have had a representative, but these were the countries who originally took the leading part in the formation and in the work of the Committee or of the Congresses. It has been suggested that the new Committee will have an additional five members elected for five years by the Permanent Committee from countries who wish to be represented, and who are ready to accept the conditions laid down for membership.

The Secretary General—to belong to Belgium.

The Permanent Committee will elect a Working Committee to go into the revision of the Statutes, which will in due course submit them officially to the various nations after its meeting in 1938.

The next Congress is to be held in America in 1939. This was made known at the Seventh Meeting of the Office de Documentation. The American Ambassador extended a warm welcome to the members of the Congress, on behalf of the American Government. Lieutenant-General Sir James Hartigan, who was presiding, referred to the great pleasure that this invitation would give, as this would be the first time that representatives of various Medical Services would meet across the Atlantic. No country could more fittingly receive the delegates. The prime duty of all medical service was the relief of suffering, and America was foremost in its upholding of all humanitarian principles.

Throughout the Congress there was an atmosphere of great efficiency, happiness and friendliness. This was due to the untiring efforts of General Iliescu and his staff, determined to make the visit of the delegates to Roumania a memorable one. Gala performances, Festivals of Youth, concerts, excursions, visits to military hospitals, banquets, all added to the gaiety and happiness of a most enjoyable and instructive ten days in a delightful country.

The chiefs of the various delegations and the members of the Permanent Committee were invited to a concert and reception given at the Royal Palace on the occasion of the visit of the President of Poland and had the honour of being presented to His Majesty King Carol and His Royal Highness The Crown Prince Michael. Sir James Hartigan also had the honour of being received by Her Majesty Queen Marie, The Queen Mother.

Clinical and other Notes.

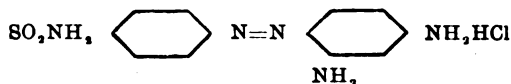
TREATMENT OF ACUTE FOLLICULAR TONSILLITIS BY PRONTOSIL.

BY CAPTAIN H. N. PERKINS, M.B., B.S.LOND.

Royal Army Medical Corps.

THE recent research work of Colebrook, Buttle, O'Meara and the staff of Queen Charlotte's Hospital on the treatment of hæmolytic streptococcal infection by prontosil in relation to puerperal sepsis, has prompted the following small scale investigation with regard to acute follicular tonsillitis. This is a very common cause of hospitalization of the serving soldier, and is responsible for a considerable period of inefficiency yearly.

The preparation used was the original red prontosil conforming to the following formula :—



or Hydrochloride of 4¹ Sulphamido—2 : 4 diaminoazobenzene.

The cases treated were naturally limited in number by the size of the station in which the investigation was carried out. The results achieved, however, are sufficiently striking and show the following points : (a) A reduction in the period of hospitalization ; (b) a shortened period of convalescence ; (c) a very small amount of a relatively inexpensive drug is necessary in each case. The financial saving is, therefore, quite easily appreciated.

A series of ten cases was treated with prontosil, whilst an equal number of cases are recorded as controls. The two series of cases were both given a standard treatment as follows : on admission, calomel 3 grains, followed by a saline purgative, sodium salicylate 10 grains four-hourly, Tab. A.P.C. as necessary. A fluid diet was given during the period of pyrexia, but was rapidly increased to a normal full diet on remission of the fever. The conditions of treatment were, therefore, identical, except that the experimental cases were given prontosil tablets (0·3 grain) each morning and evening and four of the control cases were given antistreptococcal serum 10 cubic centimetres.

The control cases were chosen to approximate in the degree of severity of the initial infection as closely as was possible to those under investigation. Very mild cases were not included in either series.

Each case treated with prontosil had several throat swabs taken for bacteriological examination. An attempt was made to culture the hæmolytic streptococcus in each case. Owing probably to the patients reporting sick as late as possible, overgrowth with secondary organisms had taken place and positive cultures were obtained in only two of the ten

cases. However, the results, although disappointing bacteriologically, would seem to be encouraging therapeutically.

Case	Maximum temperature	Duration pyrexia	Dose of prontosil
1	102° F.	36 hours	4 tablets.
2	100° F.	36 hours	3 tablets.
3	102° F.	60 hours	5 tablets.
4	101° F.	36 hours	4 tablets.
5	103° F.	24 hours	3 tablets.
6	101° F.	24 hours	3 tablets.
7	104° F.	36 hours	4 tablets.*
8	102° F.	72 hours	10 tablets.*
9	102.6° F.	36 hours	4 tablets.
10	101.8° F.	36 hours	3 tablets.

* *Hæmolytic streptococcus* isolated.

CONTROL CASES.

Case	Maximum temperature	Duration pyrexia	
1	102.4° F.	60 hours	
2	101.6° F.	84 hours	Anti-streptococcal serum.
3	101° F.	36 hours	Anti-streptococcal serum.
4	101.8° F.	96 hours	Anti-streptococcal serum.
5	102.6° F.	72 hours	
6	101.8° F.	216 hours	
7	103° F.	72 hours	
8	100.8° F.	72 hours	Anti-streptococcal serum.
9	101.4° F.	72 hours	
10	102.2° F.	60 hours	

A CASE WITH THREE SKIN ERUPTIONS.

BY MAJOR E. O. A. SINGER.

Royal Army Medical Corps.

THE occurrence of three separate skin rashes, of different ætiology, and all appearing within the space of ten days in one and the same patient, seems sufficiently unusual to deserve a short description.

Gunner K., aged 18, service eleven weeks, was admitted to the Royal Herbert Hospital, Woolwich, on May 1, 1937, suffering from headache and a slight sore throat, which had started on the previous day. The throat was injected. The temperature on admission was 99° F.; it fell to normal the same evening and remained so for thirty-six hours.

On May 3 the evening temperature was 102.4° F. and patient complained of malaise and frontal headache.

On May 4 the morning temperature was 100.6° F., pulse 92. On this morning a rash with the following characteristics was discovered: it was centrifugal and affected principally the limbs, consisting of rose macules and papules, average size a silver threepenny piece; some larger papules were present and several had hæmorrhages into their centre. There was no sign of any affection of the nervous system.

In view of the occurrence of a number of verified and suspected cases of meningococcus septicæmia, some, thanks to early treatment, of short duration, this case was considered one of them. Although a blood culture and skin lesion culture proved subsequently sterile, and a postnasal

swab negative to meningococci, this is still held to have been the correct diagnosis. Major H. L. Mann, R.A.M.C., who was at the time in charge of the case, therefore injected 50 cubic centimetres of antimeningococcal serum intramuscularly into the right thigh, and also ordered the administration of sulphonamide-P., 1 gramme t.d.s.; the latter was discontinued on May 7.

A blood-count carried out on the same day showed: total white blood-cells 22,300, with 61 per cent polymorphonuclears, 34 per cent lymphocytes, 3 per cent large mononuclears, 1 per cent eosinophils, 0.5 per cent basophils, 0.5 per cent Türk cells.

On May 5 there were still some purpuric spots present on the legs. The temperature and pulse were normal and the general condition was good. There was nothing of note in the heart, lungs, abdomen and urine.

No further developments occurred until the afternoon of May 8, when patient vomited and a generalized glandular enlargement made its appearance accompanied by pain in both groins. The evening temperature was 100° F., pulse 88.

On May 9 the morning temperature was 103.2° F., pulse 136. There was no headache, no stiffness and no fresh eruption. The generalized adenitis was very pronounced, the glands in the neck, axillæ, epitrochlears and those in the groin being affected, the latter most of all. The glands were discreet and slightly tender.

The heart, lungs and abdomen were normal and the spleen not palpable. There was an ulcer on the uvula—a swab showed nothing of note in a direct smear, and culture was negative to Klebs-Loeffler bacillus.

Glandular fever was suspected. A second blood-count was carried out consequently, and showed: total white blood-cells 26,200, with 78 per cent polymorphonuclears (as against 61 per cent five days previously), 15 per cent lymphocytes (34 per cent previously), 1 per cent large mononuclears and 6 per cent Türk cells (0.5 per cent previously).

In the afternoon, twenty-four hours after the onset of the adenitis, patient developed generalized urticaria which was very itchy, with very marked œdema of the eyelids and frequent vomiting. He was collapsed and the pulse, 100 per minute, was feeble—temperature 98.8° F. Adrenaline and heroin were administered.

It was now obvious that the second of the skin eruptions, i.e. the urticaria, along with the adenitis, was the result of the serum administration, the peculiar feature being that the adenitis preceded the urticaria by twenty-four hours.

On May 10, some swelling of the eyelids remained, but the urticaria had disappeared. There was a fresh purpuric patch on the left thigh and an area of erythema on the right buttock. The glands were smaller. The temperature kept around 99° F. and the pulse around 100. Ephedrine $\frac{1}{2}$ grain morning and evening was ordered.

On May 11, the temperature was normal, pulse 88. Patient still had

slight vomiting, his colour was poor, and he was drowsy. There were some extra systoles. Systolic blood-pressure 120, diastolic 80 mm. Hg. There were also some vague joint pains in the knees, elbows, wrists, ankles and shoulders. The ephedrine was discontinued.

On May 12, a generalized scarlatiniform rash, covering the whole body and which had appeared during the previous night, was observed. The tongue was coated and patient was still rather drowsy. Temperature normal. There was still some ulceration on the fauces—a further throat swab showed *Staphylococcus aureus* and a few colonies of a nonhæmolytic streptococcus; no Klebs-Loeffler bacillus was grown. This scarlatiniform eruption, the third of the three rashes, is considered to have been the result of the administration of sulphonamide, though it followed five days after the discontinuation of the drug (a recent number of the *British Medical Journal* mentions a case in which skin eruptions occurred after sulphonamide, including one three days after the discontinuation of its administration).

On May 13, the rash had disappeared; the evening temperature was 99.4° F. but the patient felt generally much better and took his food well. The conjunctivæ were slightly injected. No further extra systoles were observed.

A week later all glandular enlargement had subsided, and patient was discharged recovered on May 26, 1937.

My thanks are due to Colonel E. M. Middleton, O.B.E., Commanding The Royal Herbert Hospital, for permission to send these notes for publication, and to Major H. L. Mann, R.A.M.C., who had charge of the case at one period of his stay in hospital.

Echoes of the Past.

WAR EXPERIENCES OF A TERRITORIAL MEDICAL OFFICER.

BY MAJOR-GENERAL SIR RICHARD LUCE, K.C.M.G., C.B., M.B., F.R.C.S.

(Continued from p. 208).

CHAPTER XXVIII.—MEDICAL ANXIETIES.

So far, from a medical point of view, all had gone well, in fact as well as the operation itself, and at my first official interview with General Allenby on September 23, I was able to report everything satisfactory in our department, but within the next few days our troubles began. The first of these was caused by the sick prisoners of war.

Good and reasonable provision had been made beforehand for the medical care of the prisoners, but no one could have foreseen what happened

in the next few weeks. The Turkish Army was wiped out and by October 1 there were seventy thousand prisoners on our hands. Of these a very high percentage were medically unfit. There is no doubt that all through the summer the health and morale of the Turkish Force had been failing. They had had great difficulty, owing to lack of transport, in feeding their Army and they had done little or nothing to deal with the malaria question, so that they had suffered severely from this and other sickness. Before our attack the individual soldiers were already greatly debilitated from disease and insufficient nutriment. Then came the rout and the retreat with its terrible hardships of exhaustion and hunger. Added to all this, they came in for their full share, at this time, of the epidemic of influenza which had just settled on the world. They went sick in thousands. The sick prisoners were scattered all along the hundred and fifty miles between Ludd and Damascus, which latter town fell into our hands on October 1.

In their retreat the Turks had managed to destroy the railway and blow up the bridges and as we had very little road transport available to carry prisoners, they had to march back down the long route they had just fled up in their retreat. They could not be kept where they were captured as we could not feed them there; it was almost more than we could do to feed our own rapidly advancing cavalry.

By the end of the first month the total of prisoners was nearly a hundred thousand and of these twenty thousand had to come under medical charge. Probably nearly five thousand died either before or shortly after admission, though it was impossible to keep accurate records of the prisoners until they received more or less permanent quarters. No ordinary previous preparations could deal with such a situation. Big steps had to be immediately taken to cope with it. The Engineers and Ordnance Department were asked to provide two large hospital camps for 2,000 patients each at Tel el Kebir which was to be the site of a huge prisoners of war camp and another for 1,000 at Bilbeis. The accommodation could only be of the simplest kind. Beds sufficient for this number were not in existence in Egypt; all that could be expected was tents, mattresses and blankets. The existing prisoners of war hospitals were stretched to the utmost limit.

The Red Cross Hospital at Gizeh in Cairo, which had recently been handed over by the Red Cross Society to the military authorities, was cleared of British patients with a view to utilizing it for the more serious cases among the prisoners. One of the most difficult problems was the disposal of the large body of sick and wounded in the Turkish hospitals which fell into our hands as we advanced north. The most important of these were at Haifa, Nazareth, Nablus and Damascus. Though practically the whole of the Turkish medical personnel had fallen into our hands their medical officers were of very little use as organizers. They could undertake the actual medical charge of the cases, but that was

about all. The orderlies were for the most part quite useless except as hospital servants. The German orderlies, on the other hand, of whom there were a few, were first rate and made themselves most useful in the hospitals.

The Turkish hospitals were overcrowded and in a horribly insanitary condition. It was obvious, however, that we would have to make use of them for the time being and improve their condition as far as was possible under the circumstances.

On September 30, Major General Western, the Deputy Adjutant General, and I paid a flying visit to Haifa and inspected the prisoner hospital there. It was a motor drive of seventy miles each way, which we did in the day as well as inspecting all the medical arrangements both at Haifa and on the route. The Main Turkish Hospital had about seven hundred patients, many of them very chronic cases. The sanitary arrangements of the building which had been built as a civil hospital in pre-war days, could never have been very good. They had now hopelessly broken down, and the whole place was saturated with leakage from the drains. Neither the patients nor the doctors seemed to mind much, and the former were not at all particular about using even such sanitary facilities as were provided.

In Damascus things were even worse. There was a huge hospital in the Turkish Barracks containing over 2,000 patients amid sanitary conditions quite as bad as those at Haifa. There were plenty of Turkish and Syrian medical officers, but they seemed to take little interest in their work. The nursing of the patients was entrusted to quite untrained women who came in for the day from the town and clung to the place like parasites with their families for the sake of the food which was provided for them by the British Supply Department.

We were so short of British medical officers in Damascus that the administration of this hospital was for the time entrusted to an Australian combatant officer who managed to enforce discipline but could do little to improve the medical condition of the hospital.

There were concentrations of sick prisoners also at Nazareth, Tiberias and Nablus. There was also a huge concentration camp for prisoners about ten miles south of Damascus where at one time there were over 15,000 prisoners of whom a large proportion were sick and among whom there were many deaths.

During the first week in October further troubles began for the medical department. Our own sick rate, which up to this time had been quite satisfactory, began to go up by leaps and bounds. The troops as they advanced left the area which had been so carefully worked at all the summer and in which the mosquito, though not exterminated, had almost been harried out of existence. They passed through an area where nothing had been done and large numbers of our men became infected in the first few days of the advance and as the incubation period (about fourteen days)

elapsed, they began to go down with malaria. Influenza also broke out and swelled the sick lists. The ordinary sick rate was doubled and it was obvious that we were in for a bad time. The position was put plainly before the authorities and a strong recommendation made that all troops not actually engaged in the advance north should be returned to healthy areas.

The troops that had gone on north were the three cavalry divisions, under General Chauvel, the 7th Indian Division and the 54th Division. The 60th came back immediately after the enemy was routed and was sent down to Egypt. The 3rd and 75th had halted some miles north of the battle area and had not taken part in the pursuit. The 10th and 53rd of the 20th Corps were concentrated round Nablus. The Anzac Division was still engaged across the Jordan in and around Amman, clearing up the remnants of the Fourth Turkish Army. These divisions, except such troops as were absolutely necessary for line of communication purposes and for clearing up the débris left by the Turks, were withdrawn into safe quarters behind the old line. After withdrawal the sick rate in these divisions quickly subsided but with the forward troops it was otherwise.

The 7th Indian Division had to be hurried up to Haifa and was now pushing on along the coast to Beirut. The 54th had taken its place at Haifa where the men were daily becoming more infected.

Of the cavalry, the Australian and 5th Divisions were in and around Damascus, while the 4th was pushing on north still in pursuit of the Turks towards Aleppo.

The hospitals in the forward area were getting terribly congested. To relieve matters the 33rd Casualty Clearing Hospital was hurried up from Jaffa to Haifa and opened in a big Jewish Technical College there. The 32nd Casualty Clearing Hospital from Jerusalem was sent down the line to Kantara and moved up thence by sea to Beirut. It was for the moment impossible to get a casualty clearing hospital to Damascus, owing to lack of transport, and it was equally impossible to bring the sick down from there to Ludd by rail or road.

It was obvious that the only method of evacuation was to take them down to the nearest seaport and bring them down from there by hospital ships to Egypt. The only ports suitable for hospital ships at this stage were Haifa and Beirut. Two hospital ships were detailed to ply constantly between these ports and Egypt and as soon as possible a third was added.

The Haifa-Damascus Railway runs eastwards from Haifa along the plain of Esdraelon, crosses the Jordan just south of the Sea of Galilee and joins the Hedjaz railway, which runs south from Damascus along the eastern border of Syria. The railway had been badly damaged by the Turks in their retreat, especially on the east side of the Jordan, but it was repaired as far as Samakh at the southern extremity of the Lake of Galilee by October 1 and became available for moving sick to the coast at Haifa. The old French line from Beirut to Damascus, which crosses the Lebanon

and Anti-Lebanon mountains, was in bad repair though not seriously damaged, and had little rolling stock on it. The part of it which crosses the Lebanon itself near the coast is a cog-railway, and had not been used by the Turks themselves for many months. However, the road here was in fair condition and fit for motor ambulances. It was possible, therefore, to get the sick down in dribblets by rail and road from Damascus to Beirut. The 35th Motor Ambulance Convoy, the only complete unit of motor ambulances belonging to the Force, was sent up to Damascus to help in the transport of the sick down to the coast.

At Damascus many medical officers had gone sick, including some of the senior administrative officers, which made it very difficult to deal with the situation there. The hospitals were becoming overcrowded and the medical personnel, consisting only of that of the field ambulances which had accompanied the troops, was very short. Reinforcements of officers and men were hurried up but transport difficulties were serious. One party of R.A.M.C. men dispatched from Ludd was discovered by me by chance some weeks later at Haifa. I had fondly imagined that they had long been hard at work in Damascus, their destination.

Among the medical officers sent up at this time was the veteran medical missionary, Dr. MacKinnon, who had spent nearly all his working years at Damascus. It was felt that his services there, where he was so well known and so highly respected, would be invaluable. Unhappily, within a very few days of his arrival he succumbed to pneumonia, following influenza.

At this inauspicious moment an alarming outbreak of cholera occurred among the civil population at Tiberias, which lies on the western shore of the Sea of Galilee and on the only available road to Damascus. The cases were traced without doubt to their drinking the water of the lake itself into which their privies directly discharged. There is ample fresh water at Tiberias which is above suspicion, while that of the lake is brackish and distinctly unpalatable to ordinary tastes, but it has always been the custom of the inhabitants to drink this water, and no doubt it saves trouble. A party of Red Cross American Zionists, doctors and nurses, had taken up their position at Tiberias and to them was entrusted the care of the populace and the cholera hospital. At the same time Captain Compton, who was in charge of a motor mobile bacteriological laboratory, was sent up to investigate the outbreak. He and his bottle-laden car had a rough journey, but arrived in condition to do the necessary work. Strict regulations as to water supply and billeting in Tiberias prevented the spread of the epidemic to the troops, and though about fifty cases occurred, only one was a British soldier. When I visited Tiberias a week or two later the epidemic was practically over, but I was able to see what excellent work had been done by the Americans.

At the end of the first week of October when bad reports of the condition of things at Damascus were coming in I sent Lieutenant-

Colonel Bagshawe, my senior staff officer, to Damascus to investigate and report on the condition of affairs there. At the same time Captain Bird, my D.A.D.M.S., went to Haifa to organize the evacuation and embarkation of sick from that part.

The most satisfactory port for disembarkation of sick in Egypt is Alexandria, and it was to Alexandria that most of the shiploads were sent, though one or two went to Kantara. This alteration in the route of evacuation of sick to a large extent threw out of action the stationary and general hospitals at Gaza, Deir el Belah and el Arish, on the lines of communication between Ludd and Kantara. At one time it was thought that we might even have to bring patients up the line to these hospitals from Kantara. However, this retrograde movement never actually became necessary. As the numbers of sick mounted up it became evident that we were soon going to have difficulty in finding hospital accommodation for them.

Long and anxious telephone conversations took place between myself at G.H.Q. and the A.Ds.M.S. at Cairo and Alexandria. Every effort was made to increase the number of beds at both places. No. 87 General Hospital at Giza, which had been handed over for the treatment of prisoners of war, was again taken into use for British troops. The old No. 15 General Hospital in the Abbassia schools at Alexandria, which had been closed a few months earlier when the British troops were being replaced by Indians, was reopened as No. 89.

All the other general hospitals put up temporary accommodation to the utmost of their capacity. Efforts were made to induce Malta to relieve us by taking some of our cases, but without avail. India was asked to stop the despatch of convalescents to Egypt as we were unable to send them on. The Egyptian Government was approached through the Director-General, Colonel Garner, to see if they could come to our assistance again as they had done so helpfully during the Gallipoli crisis, by taking some of our sick into the State hospitals, but this time they could not see their way to do so.

The question of personnel for the new and enlarged hospitals was a serious one. Nurses were scarce and no more could be got out from Home. Many of the V.A.D. nurses resident in Egypt who had been employed almost from the beginning of the War had been recently discharged and had been taken on by the Royal Air Force. Only a few of these could be got back. Fortunately a considerable number of the excellent personnel of the British field ambulances, which had been broken up on their conversion into combined British and Indian units, were still in the country undergoing training to become infantrymen. With the consent of the Deputy Adjutant General, we drew largely on these. No extra medical officers were available; it was necessary to redistribute those we had to the best possible advantage.

On October 14, after the return of Lieutenant-Colonel Bagshawe from

Damascus, I went down to Egypt to discuss the position with Colonel Knaggs and Colonel Beach, and to see how things were getting on in the hospitals at Cairo and Alexandria. By this time a journey down to Egypt was quite a comfortable proceeding. One left Ludd at about 10 p.m., settling down to sleep in plain but quite comfortable sleeping bunks, and arrived at Kantara about 6.30 next morning, in time to get a bath and breakfast at one or other of the two stationary hospitals, whose hospitality—in which they vied with one another—was proverbial throughout the Force. On this occasion, after inspecting the 24th and 44th Stationary Hospitals and No. 2 Prisoners of War Hospital, I paid a visit to the hospital ship "Dunluce Castle," which had just arrived with a load of sick from Haifa. After lunch I drove over to Port Said by the road along the bank of the canal which had been made during the War.

The chief object of my visit to Port Said was to attend a meeting of the Consultants attached to the Egyptian Expeditionary Force. This conference was a new introduction and thenceforward became a monthly fixture. It was presided over by the D.M.S., and attended by the three consulting surgeons, the two consulting physicians, the consulting ophthalmic and aural surgeons, the consulting neurologist, the senior dental surgeon, the senior radiographer and the sanitary A.D.M.S. of the Force who acted as secretary. The A.D.M.S. Force in Egypt attended when the meeting was held in Cairo.

These conferences were of the utmost value. They enabled the D.M.S. to keep in touch with the work that was going on in the special departments of treatment. They gave opportunity for the consultants to make recommendations to the D.M.S. and to discuss lines of treatment with one another with a view to co-ordinating them throughout the Force.

The War has brought out the importance of maintaining a close touch between the administrative and professional sides of the Medical Service as represented by the Directors on the one hand and the Consultants on the other, and this can be done in no better way than by free discussion, such as took place at these conferences. Extravagant suggestions are checked by the consensus of the meeting, and valuable ones are brought out and make good. The meetings were for discussion only, and from the very constitution of the members no resolutions could be passed. From the D.M.S.'s point of view they also gave a definite occasion for a regular visit to the base, by which he could keep in touch with all that was going on there.

On the following morning I paid a visit to No. 14 Australian General Hospital to which reference has already been made. It was a huge place and contained in itself a big convalescent department. One of the chief features of Australian hospitals was the excellence and generosity of the Red Cross Society, which provided every conceivable store that would add to the comfort and amusement of their patients. This does not imply that the British Red Cross did not do the same for our own people, but it always

seemed to me that the Australians had more funds per head at their disposal, and spent them in a more fairy godmother spirit than did our own society. I dare say they were more extravagant, as fairies are apt to be.

Cairo was reached the same afternoon, and a very strenuous twenty-four hours was spent there. Into them were crammed interviews with Colonel Knaggs, the A.D.M.S., with Miss Oram, the Principal Matron, with General Watson, the G.O.C. Force in Egypt, and with my own D.A.D.M.S. at 2nd Echelon, Major Opie.

On the afternoon of the 17th I went to Alexandria to see Colonel Beach and arrived there about 7 p.m. Next day I visited four general hospitals, the Convalescent Depot and Detention Hospital, the Convalescent Hospital, eight miles out at Montaza, and the Prisoners of War Hospital. Besides this I had interviews with General Boyle, the G.O.C. Alexandria, and General Scudamore, in charge of the 3rd Echelon of G.H.Q., which, stationed at Alexandria throughout the War, dealt with all matters concerning reinforcements and War Office returns.

Next morning, the 19th, I started back for Kantara, breaking the journey for four hours at Tel el Kebir to inspect the two prisoners of war hospitals there which were just getting into full swing.

Catching the night train from Kantara, I was back in time for breakfast at G.H.Q. on the morning of the 20th, having put in five fairly strenuous days and having slept two nights in the train.

The impression formed was satisfactory. Everything was going well in Egypt. Everyone had risen to the occasion, and beds had been increased in an almost miraculous manner. The greatest credit was due to Colonel Knaggs, Colonel Beach and their staffs, for all that had been done to meet a great emergency.

At Cairo I had been met with the pleasing news that I had been promoted to the rank of Major-General, and Major Opie had the crossed swords ready to slip on my shoulders on my arrival. The day after my return I heard that my appointment as Director of Medical Services had been confirmed by the War Office.

(To be continued.)

Current Literature.

MINISTRY OF HEALTH. **Report on an Investigation into Maternal Mortality** [MACNALT, A. S., Chief Medical Officer]. Cmd. 5422. 353 pp., 13 diagrams & 6 maps. 1937. London: H.M.S.O. [5s. 6d.]

This report is of the highest interest to all concerned in Maternity and Child Welfare work and the official summary from which the following has been taken aptly and adequately presents its chief features.

The object of the investigation, in the course of which 770 deaths (or one-quarter of the total maternal deaths in 1934) were enquired into, was to see whether careful examination of the circumstances attendant on these deaths, including questions of environment as well as treatment, would indicate further measures which might be taken in order to reduce the maternal death-rate both in those areas where it is high and also in the country as a whole.

The investigators state that, though the total number of deaths due to child-bearing is relatively small (less than 8 per cent of the total deaths from all causes of women between the ages of 15 and 45) and motherhood in this country has reached a comparatively high level of safety, the rate is nevertheless capable of further reduction, for many of the deaths are preventable and the mortality rate is higher than it should be. One hundred years ago the rate is believed to have been 10 per 1,000 live births; for a number of years it has remained obstinately in the neighbourhood of 4 per 1,000 live births despite the great expansions in the maternity services and the remarkable improvement in the general health of the community. The provisional figures, however, for 1936 show a further decline, the rate for that year being under 4 per 1,000 live births and the lowest since 1922, representing 155 maternal lives saved as compared with 1935.

The investigation was of a comprehensive character. Local social and economic conditions were considered, and members and officials of local authorities, general practitioners, obstetric consultants, midwives, members of voluntary associations and women's organizations were consulted. Visits were paid to clinics, hospitals and institutions, and the efficiency of every branch of the maternity services was assessed. Supplementary statistical studies were carried out in the Ministry of Health with the assistance of the General Register Office.

The study of the circumstances associated with the maternal deaths indicates, it is stated, that in a number of cases the chances of recovery would have been greater had a practitioner experienced in midwifery been in attendance, had the doctor been assisted by an obstetric expert, or had the patient been admitted to hospital sufficiently early. It is, therefore, suggested in the Report that those general practitioners who undertake

obstetric work in connexion with the scheme of a local authority should be interested, experienced and actively engaged in the practice of midwifery, have sufficient time for unhurried work and be prepared to co-operate with the appropriate officers of the local authority and others concerned with maternal welfare.

The Report records that, as it became evident at an early stage in the enquiry that the most important single factor is the standard of midwifery practice, both domiciliary and institutional, the Minister of Health decided not to await the completion of the enquiry but to introduce at once what is now the Midwives Act, 1936, which lays the foundations of a sound national service by providing that there shall be a salaried domiciliary service of trained midwives throughout the country.

In addition to this legislative action the Minister of Health, it is stated, has been in continuous touch with the various authorities in the areas selected for enquiry, and it has been possible already to make a number of detailed suggestions relating to the special circumstances of each area.

Special emphasis is laid in the Report on the importance of combined effort and close co-operation between health visitors, midwives, general practitioners, medical officers of clinics, medical staffs of hospitals and consultant obstetricians. It is emphasized that without this team work, which the local authority is in the best position to secure, the fullest value cannot be obtained from the services provided.

A section of the report is devoted to outlining the essential requirements of a complete scheme of maternity services. Since inexperienced or inexperienced midwifery is found to be a factor of major importance in maternal mortality, special attention is directed to the importance of including in any scheme provision for the services of one or more obstetric consultants, and the Minister is urging all authorities to take all possible steps to secure that not merely is a consultant appointed but full use is made of his services in cases of doubt or difficulty before, during and after confinement. The investigators state that there is a further need for more maternity accommodation, properly constructed, adequately equipped and suitably staffed, including a sufficient number of beds for ante-natal patients, under the direction of an obstetric specialist.

As some lives are known to be lost through women being sent to hospital when they are too seriously ill to be moved or because the necessary expert services are not available in their homes, local authorities are impressed with the necessity for arranging in certain types of cases for the services of skilled hospital staff to be brought to the patient instead of subjecting her to the risk of transport to the hospital. These arrangements will, it is considered, best take the form of an emergency unit operated from a maternity hospital or the maternity department of a general hospital and available within a wide area surrounding the hospital. The report recommends also that each authority should carefully review its arrangements for ante-natal supervision and in particular should arrange for a

consultative ante-natal clinic conducted by an obstetric specialist to which difficult cases could be referred by the general ante-natal clinics or by general practitioners.

A section of the Report is devoted to the subject of abortion. Attempted abortions, the Report states, appear to be frequent and to be increasing, and to be responsible for a number of deaths from puerperal sepsis. A Departmental Committee is to be set up immediately to enquire into the prevalence of abortion and the legal position in relation to it, and to consider what steps can be taken to secure the reduction of maternal mortality from this cause.

A recent circular addressed by the Minister to maternity and child welfare authorities draws attention to the importance of each authority making arrangements to secure an adequate supply of milk or other suitable food for women throughout pregnancy.

An essential contributor to the team work on which so much emphasis is laid is the mother herself, and the Report shows the importance not only of the provision of ante-natal and post-natal supervision but of further efforts to persuade women to take advantage of the facilities provided and thus to be able to look forward with tranquillity and confidence to the birth and upbringing of their children.

With regard to housing and overcrowding, the Report states that the available evidence on the effects of bad housing and overcrowding on puerperal mortality shows that districts in which there are areas with bad housing and overcrowding are just as likely to have low rates of puerperal mortality as those in which housing is good and overcrowding is less. It appears, it is stated, to be the collective influence of many factors which predisposes towards puerperal mortality and the effects of the individual factors cannot be dissociated and separately assessed.

Reprinted from "Bulletin of Hygiene," Vol. 12, No. 7.

GRIFFIN, A. E. Observations on the Use of Copper and Chloramines in Water Purification. *Amer. J. Pub. Health.* 1937, v. 27, 226-32.

In the United States over 1,000 communities are using the chloramine process. Most of these installations are obtaining excellent results, but it is suggested that further improvement is possible by attention to certain facts which have emerged with practice. Sometimes ammonia can be added after instead of before the dose of chlorine with benefit to the quality of the water. Chloramines may be re-formed by an additional dose of chlorine to a water which has already supported a chloramine residual, provided adequate ammonia remains. The importance of taking into account the free ammonia naturally present in a raw water in calculating the amount of ammonia needed is stressed. Attention to this point may avoid operating difficulties such as tastes and periodic irregularities in the

quality of the delivered water. Reference is made to the value of copper-chloramine in the control of certain algal growths which are resistant to chloramine alone.

M. E. DELAFIELD.

Reprinted from "Bulletin of Hygiene," Vol. 12, No. 7.

LEITCH, I. **The Determination of the Calcium Requirements of Man.**
Nutrition Abstracts & Reviews. 1937, v. 6, 553-78, 4 figs. [129 refs.].

The author has assembled and analysed a large amount of data obtained by various workers on calcium balance (as shown by feeding experiments involving analysis of intake and excretion) and calcium requirements (as indicated by rate of growth and composition of the body). He concludes that the maintenance requirement for calcium in adults is 0.55 gramme daily. This is higher than Sherman's estimate which was 0.45 gramme (per man value). There is no evidence to show what additional allowance is required "for health," but it is probable that an allowance should be made. Evidence is given to show that senile osteoporosis may be due, in part at least, to calcium deficiency. It is shown that, taking the average calcium content of human milk as 0.32 gramme per litre, the amounts consumed by infants and regarded as adequate are frequently inadequate to provide sufficient calcium to maintain the correct composition of the body. Disparity may exist between the energy value and calcium content of human milk. In the artificial feeding of infants, the author believes that the buffering power of the milk towards the gastric HCl should be reduced by preliminary acid treatment, since the availability of Ca in milk depends on the pH which it reaches in the stomach. The minimum gross requirements from 6 months to 17 years of age are estimated, assuming the maximum probable retention of 50 per cent of the intake, to be in gramme Ca daily; from 6 months to 2 years, 0.8 gramme; from 2 to 9 years, 1 gramme, increasing to 2 grammes between 15 and 16 years. Thereafter there will be a gradual decrease to the maintenance requirement. The minimum adult daily Ca requirement per head of the population from 6 months of age is estimated as 0.765 gramme, and the minimum requirement of milk as 5.15 pints per week. Apart from the importance of the conclusions, the tables and figures which are given in this survey should be of value to workers interested in Ca and nutrition. The author suggests a number of problems on which further research is required.

DOUGLAS C. HARRISON.

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Reviews.

ORGANIZATION, STRATEGY AND TACTICS OF THE ARMY MEDICAL SERVICES IN WAR. By T. B. Nicholls, M.B., Ch.B., Lieutenant-Colonel, Royal Army Medical Corps. London: Baillière, Tindall and Cox. Cloth, pp. xiv + 372. Price 10s. 6d.

The author has compiled this volume from information contained in the various official manuals or derived from the study of other books of reference and of articles which have appeared in the *JOURNAL OF THE ROYAL ARMY MEDICAL CORPS*. He has embodied practical experience gained in the Great War when, as stated in the preface, he was exceptionally fortunate in that he had experience in every medical unit except a Cavalry Field Ambulance.

The book deals very largely with the work of the Medical Services on the Western Front during the Great War, and within this limitation the author is to be congratulated on collecting such a wealth of information in a most readable book, where the matter is set out in an attractive way in bold type and subdivided into paragraphs with easily legible headings.

The author in his preface states that he has adhered strictly to the official doctrines as laid down in manuals. In certain instances, however, this has not been done: a few of these are mentioned in this review.

The book is divided into four parts.

Part I deals in some sixty pages with general organization and administration. Separate chapters are allotted to appreciations, orders, returns, calculation of casualties, transport and stores.

In the chapter on orders, the author states that in his opinion the intention of the higher commander should be given in the R.A.M.C. Operation Order under the heading of Intention and not under the heading of Information. Such a departure from the official doctrine cannot be justified and can only confuse those who have to read the order. He also states that the estimated number of casualties should be included in the order under the heading of Information. It is extremely doubtful if "G" would agree to the publication of this information, whether the estimates were those made by "G" or by the A.D.M.S.; normally, this information will be given separately, either verbally or in writing.

Administrative Orders are discussed under the heading, now no longer used, of Administrative Instructions.

In the chapter on Calculation of Casualties, the author seems to regret the omission of Cron's formula from official manuals, but he has not made out a very strong case for the practical use of the formula in war. He has devised somewhat complicated formulæ to ascertain the number of cases remaining in hospital at the seventh day, on the twenty-first day and on

any day after the twenty-first day of a campaign. To what practical use these formulæ will be put remains to be seen.

The proportion of lying-down cases in the various regions in front of the Casualty Clearing Station and the accommodation available in lorries given in the chapter on time, space and transport, do not agree with what is laid down in R.A.M.C. Training Manual.

Part II deals in 142 pages with the constitution and organization of medical units. The various medical units are described and chapters are included on inland water transport, the organization of the base, the lines of communication, the distribution of casualties in the home territory, useful data and Indian units.

This part of the book contains a mass of useful information. A great deal of detail regarding establishments and scales of medical and ordnance equipment is included. Unfortunately, these matters are subject to such frequent revisions and amendments that detailed information of this nature can seldom, if ever, be up to date ; some of the details given are already out of date.

The statement made to the effect that each casualty clearing station can produce three surgical teams from its own personnel would be difficult to substantiate.

Part III is devoted to strategy and tactics.

Strategy is taken as being the preliminary steps of a battle, and under this heading the medical arrangements of the early phases of the campaign, up to and including contact with the enemy, are discussed. The author points out that the Medical Services in war have to rely on two separate organizations, namely the regular organization and the supplementary organization for the provision of extra requirements of personnel, equipment and transport, if abnormal casualties are envisaged. Many readers are likely to consider that the author, in his medical arrangements, depends too much on this supplementary organization, and even for the approach march he states that this organization will have been considered and sanctioned and the necessary additions to the regular organization provided. This is rather too optimistic a view to take of the conditions likely to obtain in the early phases of a campaign when medical units must be expected to work on a normal basis and to rely entirely on their regular organization.

In Part IV several schemes are given.

Solutions are included for some of the problems ; other problems are left without solution as material for exercises.

A very good index is provided.

In his foreword to the book, Sir James A. Hartigan, Director-General, Army Medical Services, writes: " Opinions may differ as regards some of the views expressed, but this does not, in my judgment, detract from the value of a book which I unhesitatingly recommend to all Regular and Territorial R.A.M.C. Officers."

The book requires no better recommendation than this. It will be of particular value to officers studying for examinations for promotion, but officers must realize that the book can never entirely take the place of the official manuals.

DISEASES OF THE HEART. By Sir Thomas Lewis, C.B.E., F.R.S., M.D., D.Sc., LL.D., F.R.C.P. Second edition. London: Macmillan and Co., Ltd. 1937. Pp. xx + 297. Price 12s. 6d.

The new Second Edition of Sir Thomas Lewis's well-known book has been thoroughly revised and brought up to date in all the recent advances in cardiology. Additional factors in the production and relief of cardiac œdema are discussed. Nitroglycerine (glyceryl trinitrate) in doses of $\frac{1}{100}$ grain repeated when necessary given as a tablet chewed and swallowed is in the author's view as effective as amyl nitrite in relieving angina pectoris and gives rise to much less throbbing and headache.

Thyroidectomy is not considered to have yet been established as a satisfactory remedy for the relief of the pain in angina.

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This excellent book is again confidently recommended. A. G. D.

DIATHERMY—INCLUDING DIATHERMOTHERAPY AND OTHER FORMS OF MEDICAL AND SURGICAL ELECTROTHERMIC TREATMENT. By Elkin P. Cumberbatch, M.A., B.M., D.M.R.E., F.R.C.P. Third edition. London: W. Heinemann (Medical Books), Ltd. 1937. Pp. xvi + 576. Price 21s.

This book is a complete account of the various uses of currents that oscillate with high frequency. The physics associated with these currents is explained in a readily readable form in Part I.

Well-known authorities have contributed their experiences in the use of these currents as applied to their specialities.

Well illustrated and supplied with a full index, this book can be recommended to anyone desirous of information regarding the modern usages of diathermy.

Correspondence.

APPENDICITIS.

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—With your permission, I should welcome an opportunity to reply to the criticism of my article in the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, of July, by Colonel C. M. Finny, O.B.E., F.R.C.S. (Corps Journal Correspondence of September, 1937).

In the first place, my article was entitled "Pain in the Right Iliac Fossa," and *not* "Appendicitis." This is important because the title was chosen deliberately in order that cases of acute appendicitis should not be confused with those cases of pain in the right iliac fossa, which, in my opinion, are not acute appendicitis, and of which one sees so many in the Service. I think that all authorities are agreed that *definite* cases of early acute appendicitis should be subjected to immediate operation.

I cannot agree with Colonel Finny, when he says that if a case of "an attack suggesting appendicitis" is operated upon, an inflamed appendix will be found. I have seen many cases of this type, both in civilian and in military hospitals, in which the abdomen has been opened and a normal appendix has been removed. It is true that the majority of these cases recover, and that their symptoms disappear; but, occasionally one comes across unfortunate tragedies such as paralytic ileus, post operative adhesions, etc. These cases will recover without operation, therefore I maintain that they should not be subjected to the unnecessary risks of an operation.

Colonel Finny says that it is impossible to know beforehand which cases will go on to peritonitis. Agreed, but if these cases are treated in hospital, under the care of a competent doctor, preferably the surgeon who might have to operate, they can be subjected to immediate operation should the case show any signs of approaching peritonitis. I drew attention to this, where I suggested a line of treatment of those cases described under the heading of Category D in my article. The fact that many cases in civilian life are not treated in hospital from the start, but are sent to the surgeon more or less *in extremis*, no doubt is contributory to the high annual mortality suggested by him. Fortunately, in the Service available hospital accommodation is better than in civilian life, and these cases are usually treated in hospital.

It is stated in Colonel Finny's letter "Why wait for signs of peritonitis before operating?" I made no reference to waiting for signs of peritonitis, but suggested that in Category D cases, immediate laparotomy should be performed as soon as *one* or more (they may occur concurrently) of certain signs appeared. This is a vastly different state of affairs to an established peritonitis.

There is no question of depriving a patient "of the chance of a safe removal of the source of his trouble," because I maintain that in many cases of pain in the right iliac fossa, which are sent into hospital labelled "Acute Appendicitis," the source is *not* an acutely inflamed appendix. Surely laparotomy is not justified in these cases when such things as deaths under anæsthetics, paralytic ileus, not to mention other troubles, are known still to occur?

Colonel Finny agrees with me in that he says he does not operate upon every case of appendicitis forthwith, but he goes on to say that he considers my line of treatment "not only wasteful in time but actually dangerous." I feel that I must be permitted to challenge this statement. Surely the question of time is of little importance when the future welfare of the patient is considered?

As regards danger, I would mention that the Ochsner-Sherren method of treatment of appendicitis, when properly carried out, has given excellent results. Also I have been using my line of treatment for over six years, and admittedly the number of cases is not great, but as far as I can recollect (I have not my figures with me), my mortality in these cases has been *nil*. I attribute this success to watching the cases myself and not relying upon the observations of others.

In conclusion, I welcome the criticism of Colonel Finny, but I feel that if he will reread my article, he will conclude that it refers not to those cases of obviously acute appendicitis, but to those vague cases *suggesting* appendicular trouble, and which would be more correctly described as pain in the right iliac fossa, and which are *not* legitimate cases to be submitted to the risks of laparotomy. If these cases are treated in hospital, carefully watched and operated upon should the necessity arise, the danger is infinitesimal; moreover it compares very favourably with that incurred in any major operation.

Royal Societies' Club,
St. James's Street, London, S.W.1.
September 21, 1937.

I am, etc.,
K. FLETCHER-BARRETT.

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Original Communications.

THE MEDICAL SERVICES IN PALESTINE, 1936.

BY MAJOR-GENERAL R. W. D. LESLIE, O.B.E.

THIS outline of the work of the Medical Services in Palestine during 1936 is perhaps chiefly of interest in showing in Phase I the stages of development of the different medical organizations which catered for the requirements of the gradually increasing force—culminating in the arrival of the 1st Division.

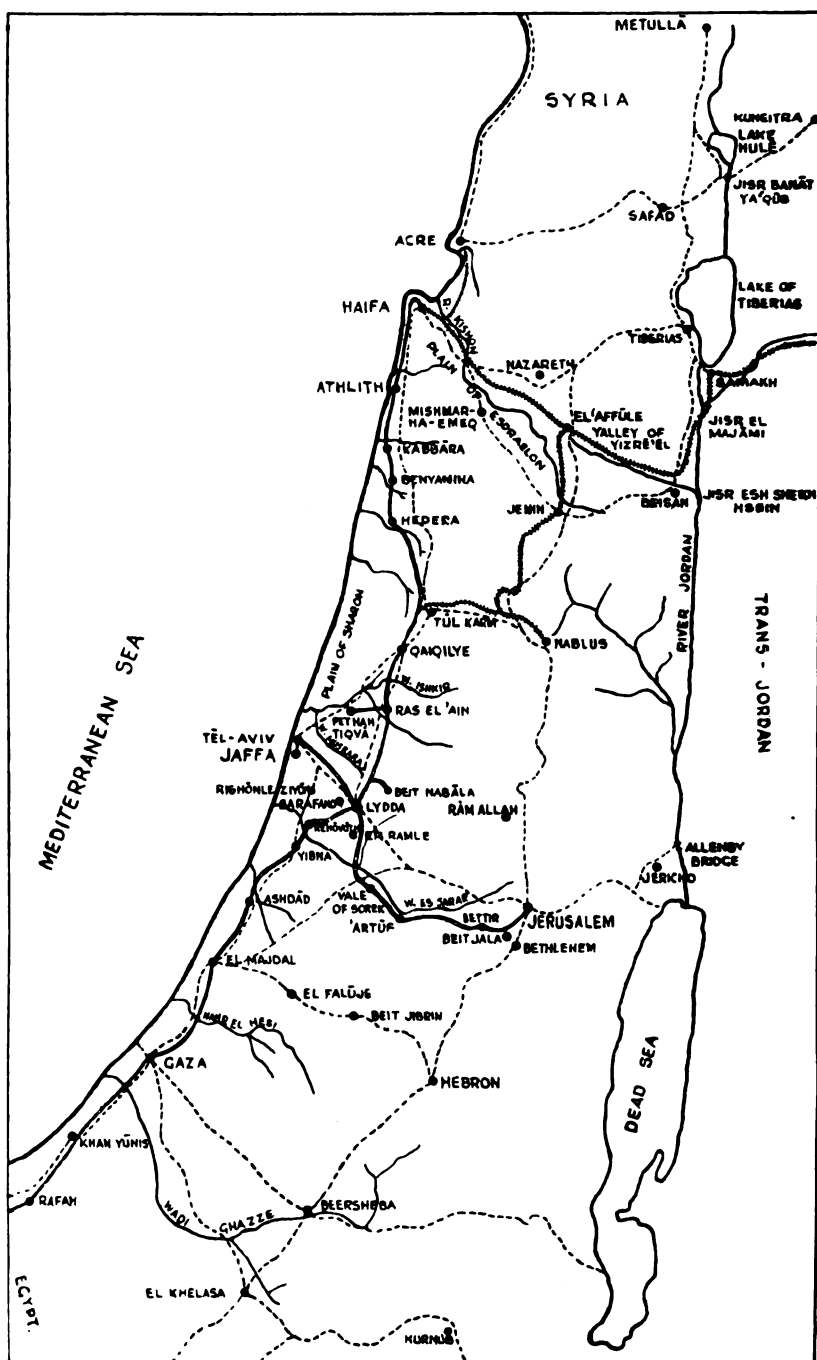
The operations in Palestine offered little or no scope for the tactical employment of medical units, and from this point of view interesting situations are lacking.

A brief description is given in Phase II of the reduction of the medical organizations which followed on the withdrawal of troops from Palestine and the establishment of a semi-permanent garrison.

PHASE I—CONSTRUCTION.

In normal times the British troops in Palestine, in addition to the R.A.F., consisted of two infantry battalions, one company of R.A.S.C., and a detachment of R.A.M.C. made up of two officers and twelve other ranks. These troops were under the orders of the Air Officer Commanding the British Troops in Palestine, but for administration and training they came under the General Officer Commanding the British Troops in Egypt. Of the two infantry battalions, one was stationed at Jerusalem and the other at Haifa.

The medical establishments consisted of the R.A.F. General Hospital



at Sarafand with accommodation for 126 patients, and Reception Stations at Jerusalem and Haifa with accommodation for ten and eleven patients respectively. These reception stations were staffed by R.A.M.C.

The Chief Administrative Medical Officer was the P.M.O., R.A.F. Palestine and Transjordan.

In April, 1936, the Arab strike was declared, and by June the garrison in Palestine had been increased by six more battalions, one motorized cavalry regiment, two field companies R.E. and one company R.A.S.C. The Headquarters 15th Infantry Brigade was also moved from Egypt to Palestine.

To cope with this increase the R.A.F. General Hospital at Sarafand was expanded to take 216 patients, by utilizing verandahs and erecting tents, and the Reception Station at Jerusalem was increased from ten to thirty-eight beds by taking over adjacent barrack huts. In the same way the Reception Station at Haifa was increased from eleven to thirty-six beds. Extra personnel for staffing the reception stations was sent from Egypt. On June 26 extra huts were taken over by the Reception Station, Haifa, and accommodation provided for one hundred patients; the name then being changed to Military Hospital, Haifa. The staff of this hospital was increased to four officers and twenty-seven other ranks. Additional ordnance and medical equipment was supplied from Egypt where an Advanced Depot of Medical Stores was established.

As the situation in Palestine developed two more battalions arrived in July, making the total of infantry battalions ten. The R.A.F. General Hospital was then increased to 230 beds.

The 3rd General Hospital, with accommodation for 1,200 patients, had been sent to Alexandria during the Italo-Abyssinian emergency and was available for cases from Palestine, but although a certain number was evacuated to this hospital the journey was a trying one. Patients were carried in rail ambulance coaches attached to the ordinary Palestine-Egypt train which travelled very slowly on account of the danger of sabotage. Attendants and equipment had to travel in the coaches with the patients, and feeding arrangements were difficult to arrange.

One more battalion of infantry was sent to Palestine in August, but no further increase in medical establishments was made.

The Force in Palestine still remained under the orders of the Air Officer Commanding except for administration, which continued under the General Officer Commanding the British Troops in Egypt.

Early in September, owing to the threatening attitude of the Arabs, Corps Headquarters, the First Division from Aldershot and Headquarters 5th Division from Egypt were ordered to Palestine. Additional troops, including a Cavalry Armoured Car Regiment, one company of Light Tanks, R.A., R.E. and R.A.M.C. units were also despatched.

The whole Force then came under the orders of Lieutenant-General Dill as an independent command, although certain administrative details

still continued to be dealt with by Headquarters, British Troops in Egypt. For the administration of the Medical Services a D.D.M.S. was appointed assisted by a D.A.D.M.S. and a D.A.D.H. Each Division had its A.D.M.S. Corps Headquarters, Headquarters 1st and 5th Divisions and advance troops arrived at Haifa on September 23, and the remainder rapidly followed. Corps Headquarters and Headquarters 1st Division went at once to Jerusalem, but Headquarters 5th Division remained at Haifa as this Division was taking over the Northern Area.

The distribution of the Divisions was as follows :—

Northern Area.

Headquarters 5th Division	...	Haifa.
13th Infantry Brigade...	...	Nazareth, Tiberias, Safed.
15th Infantry Brigade...	...	Haifa, Acre, Mishmar, Hadera.
16th Infantry Brigade...	...	Nablus, Tulkarm, Jenin.

An Armoured Car Regiment at Jenin.

Southern Area.

Headquarters 1st Division	...	Jerusalem.
1st Guards Brigade	...	Jerusalem, Beit Jala.
2nd Infantry Brigade	...	Jaffa, Sarafand.
3rd Infantry Brigade	...	Jerusalem, Ramallah, Bethlehem, Hebron.

One motorized Cavalry Regiment was at Gaza with a Squadron at Beersheba,

An armoured train manned by the Royal Navy operated in the Northern Area.

Medical units allotted to the Force consisted of No. 4 Field Ambulance, the 2/3rd Cavalry Field Ambulance, No. 3 C.C.S., No. 7 Field Hygiene Section, and No. 3 M.A.C.

No. 4 Field Ambulance arrived in Palestine from Egypt on September 17, and took over the Military Hospital, Haifa, with orders to increase it to 300 beds. This was almost completed by the time the First Division arrived. Accommodation was made for 150 patients in huts, the remainder in marquees. The situation of this hospital was not ideal, as it was right in the midst of the infantry units in the barracks, and lighting in the tents at night was inadequate—only hurricane lamps being available. As an emergency measure, however, it served its purpose.

Six members of the Q.A.I.M.N.S., including a sister-in-charge, were sent from Egypt to work in this hospital and their services raised the standard of nursing considerably.

The Field Ambulance had not all its personnel with it at Haifa as half "A" Company had been sent previously from Egypt to increase the staffs of the reception stations in Palestine, and a number of the personnel of "B" Company had been distributed amongst the battalions in Palestine as orderlies in charge of Medical Inspection Rooms. "B" Company men were, however, recalled, as the regiments had their own personnel for this purpose.

Of the other medical units allotted to the Division, the only one in Palestine was the Field Hygiene Section—also at Haifa. The 2/3rd Cavalry Field Ambulance was still in Egypt and No. 3 C.C.S. was on the way from England and not due to arrive in Haifa till early October. A number of motor ambulances from No. 3 M.A.C. were already in Palestine but the Headquarters and two Sections (less vehicles mentioned) were in Egypt. The Headquarters eventually arrived, but this Motor Ambulance Convoy was never employed as a unit in Palestine.

The position as regards medical units in Palestine on the arrival of the 1st Division was, therefore: the R.A.F. General Hospital at Sarafand with accommodation for 230; the Military Hospital, Haifa (No. 4 Field Ambulance), with accommodation for 300; and the Reception Station at Jerusalem with sixty beds.

The Base Hospital for the Force was the 3rd General Hospital at Alexandria, and the method of evacuation by (a) Rail Ambulance Coaches; (b) Hospital Ship—the Royal Naval Hospital Ship “Maine” had been placed at the disposal of the G.O.C. Force in Palestine, but was not due at Haifa till September 29.

As the margin of beds available for casualties and sick was not very wide and H.T. “Nevasa,” which had special accommodation for invalids, was arriving at Haifa with troops about September 24, it was decided to make use of her to evacuate patients to Alexandria on her return journey to the United Kingdom. Seventy-two cases were embarked on September 25, and sailed for Alexandria the same day. An Embarkation Medical Officer was appointed at Haifa, but as several hospitals were usually involved in an embarkation, the allotment of berths, preparation of nominal rolls, etc., were centralized at Corps Headquarters. Each hospital was ordered to send daily to Headquarters the number of patients awaiting evacuation.

When the Hospital Ship “Maine” arrived the alternate ways of employing her—i.e. as a carrier or base hospital—were carefully considered and it was decided to use her as a “carrier” at the outset. The reason for this was that as a hospital ship she could only take about 100 patients in cots; the rest of her accommodation being in three-tier berths, which would be unsuitable for nursing when the ship was stationary. As a hospital, therefore, she would not be able to relieve the situation to the same extent as a “carrier,” and with the comparatively few beds available, this was important. Ambulance coaches were, of course, available in emergency, but it was thought better to evacuate patients in comfort by hospital ship rather than by a trying railway journey. 166 patients were accordingly embarked in the “Maine” on October 7, and she sailed for Alexandria the same date on her first trip.

The 2/3rd Cavalry Field Ambulance arrived on October 9 with a strength of five officers, including a quartermaster, and seventy-five other ranks, and immediately proceeded to Nazareth under orders of A.D.M.S.,

5th Division, to open a main dressing station there in the Hospice Casa Nova to deal with light cases from the Northern Area and relieve the strain on the Military Hospital, Haifa. The ordnance equipment for this main dressing station was drawn from the Ordnance Depot at Haifa and included barrack bedsteads; while medical equipment was issued from the Military Hospital, Haifa. This enabled the Field Ambulance to keep its own equipment more or less intact and not lose mobility to any marked extent—an important consideration, as this was the only really mobile medical unit with the Force; the 4th Field Ambulance being occupied in staffing the Military Hospital, Haifa.

On October 12, No. 3 C.C.S. disembarked at Haifa and was transported to an Arab Industrial School, about seven miles from Haifa on the Haifa-Acre Road, with orders to open as a hospital there for 240 patients. This school had only just been built—in fact, it was still in the hands of the contractors—and owing to this there was some delay before this hospital opened, which was eventually on October 26. Meanwhile, an advance party had been sent by the 4th Field Ambulance to take over the Hospice Notre Dame in Jerusalem with a view to opening a 200-bedded hospital there when the casualty clearing station was established at Haifa; and on October 13 accommodation for fifty patients was available in the Hospice. These extra beds in Jerusalem were very welcome, as the sixty beds in the Reception Station there were insufficient to take the strain off the R.A.F. General Hospital at Sarafand.

The advance party from No. 4 Field Ambulance to start the new hospital in Jerusalem consisted of three officers, including a quartermaster and twenty-nine other ranks, R.A.M.C. The sister-in-charge and one other member Q.A.I.M.N.S. accompanied the advance party; four additional members arriving later. A matron and nine members Q.A.I.M.N.S. arrived with No. 3 C.C.S. and were temporarily employed with No. 4 Field Ambulance in the hospital at Haifa pending the opening of the new hospital in the industrial school.

The Force in Palestine now approximated to 22,000 and the total hospital accommodation in medical units in Palestine amounted to 580 beds of which over two-thirds were occupied. There were in addition the sixty beds for light cases in the reception station at Jerusalem and a few beds available in the Government hospitals at Haifa and Jerusalem—the latter had already been very helpful in admitting emergency cases unfit to move to Sarafand.

Casualties were mostly due to sickness, but a certain number resulted from encounters with Arabs. Fortunately the weather was excellent and the sick rate remarkably low.

On October 15 arrangements were made for the Hospital Ship "Maine" to take another convoy to Alexandria and 170 patients were embarked. Prior to this embarkation the vacant beds had fallen to just over 100. Steps were meanwhile taken to make up a complete ambulance train with

accommodation for 120 patients by utilizing the four ambulance coaches of the Egyptian State Railway and adding a kitchen coach and one for personnel and equipment.

This ambulance train being quite self-contained provided a much greater degree of comfort than ambulance coaches attached to the ordinary train. The coaches were ferried across the Canal at Kantara.

No. 3 C.C.S. opened as a Military Hospital, Haifa, in the Arab Industrial School on October 26, taking in ninety-one patients from No. 4 Field Ambulance which closed preparatory to moving to the Hospice Notre Dame, Jerusalem, to join the advance party. On the same date the Hospital Ship "Maine" made its third and last trip to Alexandria, embarking 140 patients, the majority coming from 4th Field Ambulance. This embarkation was timed to coincide with the closing of 4th Field Ambulance and opening of the casualty clearing station and so lessen the number of patients to be transferred from one to the other. The Hospital Ship "Maine," after arrival at Alexandria, had orders to proceed to Malta to resume her legitimate duty with the fleet, but subject to recall to Haifa at eight days' notice. It was felt that with the number of beds now available, and the presence of the ambulance train, there was no necessity to keep the hospital ship standing by; furthermore, orders had just been received regarding the withdrawal of some of the troops from Palestine, commencing with the release of all Section "A" Reservists and the 5th Division.

On October 27 the position of medical units in Palestine was as follows:—

The 4th Field Ambulance had opened the Military Hospital, Jerusalem, in the Hospice Notre Dame, for 200 patients; No. 3 C.C.S. had opened the Military Hospital, Haifa, at the Arab Industrial School for 240 patients; the R.A.F. General at Sarafand had accommodation for 230 patients, and the reception stations at Jerusalem and Haifa had reverted to their original accommodation of ten and eleven beds respectively. The 2/3rd Cavalry Field Ambulance had accommodation for light cases in the Hospice Casa Nova, Nazareth. The total number of hospital beds, therefore, amounted to 670, which proved ample for the requirements of the Force, and except for a few special cases no further evacuation of patients to Egypt took place.

MILITARY HOSPITAL, JERUSALEM (HOSPICE NOTRE DAME).

The Hospice Notre Dame is a large three-storied building with a central block and two wings; the central block being entirely occupied by a church except on the ground floor. Half the accommodation on the first floor was reserved for the Fathers of the Order, but otherwise the whole building with the exception of the church was available for the hospital.

Owing to the fact that the accommodation consisted mainly of numerous small rooms, adaptation as a hospital was not easy, but on the ground floor the dining rooms, sitting rooms and vestibules made quite effective wards.

There was an excellent kitchen and a large dining hall connected by a covered way with the main building. Water from the Municipal Water Supply was good and adequate, and electric light was supplied from the main Jerusalem supply.

A good deal of preliminary work was necessary, such as the provision of heating, lighting and plumbing for the operating theatre; provision of a hand-operated lift from the ground to the third floor; provision of shelves and racks in pack store, linen store, medical stores, etc.

The annexes were good and modern in design, but some of the W.C.s had to be converted into bed-pan sluices. Baths were not sufficient, but this was overcome by converting some of the bathrooms into "shower-rooms." Sinks were installed in rooms used as ward sculleries and clinical side room.

All the rooms were already furnished but the furniture was cleared and stored in one of the partitioned off passages with the exception of beds, mattresses, bolsters and pillows and a few items likely to be useful in lieu of barrack equipment.

The accommodation was normally for 200 patients, but in emergency, this could be expanded to 240.

The more serious cases were put on the ground floor to avoid carrying up and down stairs as there was no lift—the hand-operated lift could only be used for small articles.

The portion of the Hospice used as a theatre block consisted of a dining room used as a theatre proper, and four small rooms which became respectively pre-operation room, sister's room, store room and sterilizing room.

The theatre was specially fitted with an operating light, scrubbing up sink and a general purposes sink.

A separate radiator system was installed with a William's Oil-O-Matic furnace which supplied hot water for the heating and washing. It proved very convenient and efficient in practice.

The disinfecter was a portable Manlove Alliott. Instruments were boiled in small sterilizers heated by primus stoves.

Ordnance and medical stores were received from Headquarters No. 4 Field Ambulance, Haifa, Ordnance Depots and medical units in Egypt and Palestine.

Except for the limited work which could be carried out in the clinical side rooms, special investigations were done in the Government Laboratory, Jerusalem, by arrangements with the Department of Health. X-ray examinations were carried out in the Government Hospital, Jerusalem, or at the R.A.F. General Hospital, Sarafand.

Sisters' quarters were in a wing on the first floor and R.A.M.C. personnel were accommodated on the second and third floors, where room was also provided for a N.A.A.F. Institute.

The officers messed and lived in a Pension close by.

A total of 15 officers and 478 other ranks were treated in this hospital and 52 surgical operations were performed.

There were two deaths, both from pneumonia.

This hospital was initiated and maintained entirely by No. 4 Field Ambulance until the phase of closing down commenced, when certain of the personnel as they returned to the Home Establishment were replaced by personnel from the 2/3rd Cavalry Field Ambulance.

The nursing, cooking and general duties were very efficiently carried out and the general standard was high. The presence of members of the Q.A.I.M.N.S. enhanced the nursing arrangements.

MILITARY HOSPITAL, HAIFA (No. 3 C.C.S.).

The Arab Industrial School, Haifa, consisted of two large two-storied buildings with several smaller ones. The main building provided most of the hospital accommodation and also an excellent kitchen and large dining hall. The other large building formed the administrative block, dispensary, pack store, laboratory, etc. and provided accommodation for convalescents.

This school was more adaptable as a hospital than the Hospice Notre Dame in Jerusalem, on account of the many large well-lighted and ventilated rooms which made excellent wards.

Certain small structural alterations were, however, necessary and proper cooking apparatus had to be installed in the kitchen as this had not been provided. A Warren range, supplemented by oil cooking stoves, gave satisfactory results.

Most of the wards had an annexe but the native pattern latrines had to be converted to the European pattern.

There was a central hot water system and hot water could be procured from the annexes.

The room selected for an operating theatre was situated between the two main surgical wards and was fitted with special light, wash hand basins, etc. The casualty clearing station brought its own mobile disinfecter which was housed in a specially constructed hut alongside the theatre.

A pathological laboratory was fitted up with special equipment sent from Egypt and a large amount of pathological material was dealt with.

The X-ray department ceased to function a fortnight after the hospital opened owing to a break down in the X-ray plant, but X-ray examinations were carried out at the Government Hospital, Haifa.

One hundred and ninety beds with equipment were taken over from the Military Hospital, Haifa (No. 4 Field Ambulance), when it closed down; the other fifty beds being casualty clearing station equipment.

The scales of medical equipment normally allowed for a casualty clearing station had been increased before No. 3 C.C.S. left England, but additional medical and ordnance equipment was drawn as required from Palestine or Egypt.

As already stated there was an advanced depot of medical stores in Egypt and the R.A.F. General Hospital had also a large reserve.

The disposal of sewage was by septic tanks originally intended to cater for 120 individuals. These, however, proved inadequate for the number of patients and personnel in the hospital and entailed a great deal of labour in the construction of special trenches and pits. The labour, however, did not fall on the personnel of the casualty clearing station.

The water supply was from a well which was pumped by an electric centrifugal motor pump into storage tanks on the roof of the main building. Owing to the comparatively close proximity of septic tanks to the well and the presence of pyocyanus found in the water on frequent examinations, chlorination was carried out.

Lighting was by electricity.

Sisters were quartered in a small modern house in the grounds, with two marquees in addition, but the latter were replaced by huts which were completed just before the rains broke.

R.A.M.C. personnel—officers and other ranks—were housed in tents near the main building, where tents for the N.A.A.F. Institute were also provided.

There was a railway siding about a hundred yards from the main building, and connected with it by a road specially made by the Royal Engineers.

Cases totalling 507 were treated and 79 operations performed. There were no deaths.

The same efficiency which marked the work in the Hospice Notre Dame, Jerusalem, was evident here, and the high standard of nursing reflected great credit on all concerned. The presence of members of the Q.A.I.M.N.S. contributed much to the excellent work.

MEDICAL ARRANGEMENTS.

The troops were very widely dispersed and on this account an ambulance car was attached to each unit under Divisional arrangements. In addition there were ambulance car pools at Jerusalem and Haifa and the 2/3rd Cavalry Field Ambulance had its own transport.

Casualties in any one action were comparatively few and in no instance was a mobile medical unit necessary; a sufficiency of motor ambulances being all that was required. Operations were confined to numerous patrols, convoys or small columns making local "drives."

Owing to the number of patrols and convoys it was impossible to furnish medical personnel for each, and regimental medical officers were, therefore, instructed to train as many men as possible in first aid and these, with the provision of first aid outfits, met the situation.

Casualties in action were taken to the nearest military, Government or voluntary hospital after receiving first aid. No difficulties arose in this respect.

Government hospitals were situated in Jerusalem, Haifa, Jaffa, Gaza, Nablus, Safed and Beersheba; and voluntary hospitals in Jerusalem, Haifa, Jaffa, Gaza, Nablus, Safed, Nazareth, Beersheba, Affuli, Tiberius, and Hebron. Every permanent police post was equipped with a first aid outfit and a stretcher.

Cases treated in Government or civil hospitals were removed to the nearest military hospital as soon as they were fit to travel.

In order to keep the distribution of the sick to hospitals as even as possible, normal routes were laid down as follows:—

In the Northern Area.—Sick from the 15th and 16th Infantry Brigades (except Nablus) were sent to the Military Hospital, Haifa. Those from the 13th Infantry Brigade were staged through the 2/3rd Cavalry Field Ambulance at Nazareth. Cases from Nablus were evacuated to Jerusalem.

In the Southern Area.—Cases from the 2nd Infantry Brigade went to the R.A.F. General Hospital direct, and those from the 1st Guards Brigade and 3rd Infantry Brigade to Jerusalem. The unit motor ambulance was the usual method of transport, but the railway was used in certain instances.

If the emergency demanded it, cases could be transported by air, but as the main roads were excellent and hospitals comparatively close at hand, this method was rarely called for.

As in the cases of casualties in action, sick could also be admitted to the nearest civil or voluntary hospital in case of necessity; all unit medical officers being provided with a list of these hospitals. Certain outlying regimental units had a few beds for the detention of minor cases.

SPECIAL CASES.

The R.A.F. General at Sarafand had a limited accommodation for infectious cases, but as a rule these patients were admitted to the nearest Government Hospital. V.D. cases were concentrated at the R.A.F. General Hospital where facilities for special treatment existed.

Arrangements were made for eye cases to be treated in Jerusalem at the Ophthalmic Hospital of the Order of St. John of Jerusalem. Patients were admitted if necessary, but the majority attended as "out-patients," being accommodated at the Reception Station, Jerusalem, if coming from out-stations.

An ear, nose and throat specialist was also available at the Government Hospital, Jerusalem, and the same arrangements for attendance were made as in the case of ophthalmic cases.

A consulting surgeon and a consulting physician for the military Forces in Egypt and Palestine were appointed. They remained normally in Egypt and visited Palestine as required. When their services were asked for, a special telegraphic code was adopted by which the degree of emergency was made known. In very urgent cases the telegram was

repeated to Headquarters, R.A.F., Cairo, to ensure a plane being in readiness to bring them to Palestine.

There were four dental officers with the Force including one R.A.F. dental officer at Sarafand. The A.D. Corps officers were situated at Jerusalem, Haifa and Nablus and the senior dental officer (who was provided with a travelling outfit) also visited some of the more distant stations.

There was no inspecting Dental Officer with the Force, but the Inspecting Dental Officer, Egypt, acted in this capacity.

HEALTH AND SANITATION.

The health of the troops on the whole was very good and with the exception of sandfly fever there was no marked incidence of disease. Troops in or near Haifa were the worst sufferers from sandfly fever, and troops guarding railway lines were specially affected as they were necessarily split up into small parties, and although nets and bamber oil were ordered for all sentries, supervision was difficult.

Malaria cases amongst the troops were relatively few owing, in no small degree, to the excellent anti-malaria work carried out by the Civil Health Department, and also to the fact that troops in the very malarious regions were few and for considerable periods at a stretch there were no British Troops in the Jordan Valley.

At one place on the coastal plain, Ras-el-Ain—the headquarters of the Jerusalem Water Supply—the incidence of malaria amongst the troops guarding the pumping station was very high, but when their huts were mosquito-proofed and personal prophylactic measures enforced a marked improvement was effected.

All troops were provided with nets and those going to known malarious regions were given prophylactic quinine.

Dysentery cases were also few in spite of the flies which, needless to say, abounded. The usual battery of lethal weapons, including fly-sprays, fly-papers, fly-traps and flaps were employed; and cookhouses, dining rooms, etc., were protected by wire gauze.

Ten yards of muslin for food protection were authorized for each company.

All officers and other ranks were fully protected by T.A.B. vaccine and although typhoid and paratyphoid are endemic in Palestine these diseases were negligible as far as the troops were concerned.

As regards conservancy, the fly-proof bucket system was in general use. The night soil was removed by contractors and buried, as incineration was impracticable owing to lack of fuel.

The disposal of sullage water in Palestine is a problem owing to the poor absorptive capacity of the soil, and this added to the difficulties of dealing efficiently with water from laundries, ablution benches and cookhouses.

Most of the troops were housed in billets which varied considerably, and included private houses, schools, stores and hotels. On the whole they were reasonably good and commodious.

Those for whom billets were not at once available were accommodated in tents, but as the rains were expected to break in mid-November efforts were made to have all troops in billets before then. This was not, however, managed and some troops had to move into hastily found billets when their camping ground was rapidly converted into a quagmire. Fig. 1 shows the appearance of a camp site on the second day of the rains.



FIG. 1.—A camp on the second day of the rains.

All men were provided with bed boards and straw palliasses ; the boards being raised off the ground by trestles.

During the strike most battalions had men at posts (guarding railways, roads and water-works, etc.), which varied in size from half a dozen men to a company. Some were billeted, some in tents and some in bivouacs.

The wide dispersal of a unit made the task of the regimental officers none too easy.

Safe water in reasonable quantities presented no difficulty owing to the excellent work carried out by the Department of Health, in finding and utilizing new sources. In a few instances bathing was restricted until

a pipe line could be laid and showers installed ; and one or two units carted the water from the nearest municipal well.

The water supply to Jerusalem, which was inaugurated early in 1936, is piped from springs at Ras-el-Ain about 40 miles away.

The rest of the water supply in Palestine comes from wells which are carefully supervised and examined by the Civil Department of Health.

Chlorination was rarely necessary.

PHASE II—REDUCTION.

This phase was to some extent a reversal of Phase I, but complicated by the fact that some of the R.A.M.C. personnel in Palestine belonged to Egypt (Normal Tour), some to Malta, and the remainder had come direct from England or from Egypt—after the Italo-Abyssinian emergency—and it required a good deal of adjustment between the medical units in Palestine to arrange the medical establishment for the final garrison.

The withdrawal of troops from Palestine commenced with the return to England of all Section "A" Reservists, and as No. 3 C.C.S. was almost entirely composed of this class they had to be replaced with personnel from the 2/3rd Field Ambulance and No. 4 Field Ambulance—the casualty clearing station at this stage had a good many patients in the hospital at Haifa and was not likely to close for several weeks.

The 2/3rd Cavalry Field Ambulance at Nazareth was the first medical unit to close down, after which it proceeded to Jerusalem, where it was the intention to store the equipment, park the vehicles and reduce the personnel to a cadre. Many of the personnel had already been distributed to other units.

As the withdrawal of troops from Palestine proceeded, admissions to the Military Hospital, Haifa (No. 3 C.C.S.) and the Military Hospital, Jerusalem (4th Field Ambulance), gradually decreased, and on December 15 orders were issued for the two hospitals to close for further admissions and to transfer any remaining cases, as soon as they were fit to move, to the R.A.F. General Hospital, Sarafand ; those from Haifa being sent by rail ambulance coach and those from Jerusalem by ambulance car. At the same time the Reception Stations at Jerusalem and Haifa were expanded to thirty beds each and equipped as small hospitals, the staff of each reception station including two members of the Q.A.I.M.N.S.

The R.A.F. General Hospital at Sarafand with the two expanded reception stations constituted the final medical establishments of the semi-permanent garrison of seven battalions and ancillary troops.

The 2/3rd Cavalry Field Ambulance with its cadre of twenty other ranks moved from Jerusalem to Sarafand where its equipment was stored and the vehicles parked.

The bulk of troops, including R.A.M.C., surplus to the semi-permanent garrison had left Palestine by December 21, but "rear parties" of the R.A.M.C. remained until January with No. 3 C.C.S. and No. 4 Field

Ambulance respectively to complete the closing down of these units, handing over buildings, etc.

The following table shows the casualties which occurred in encounters with the Arabs :—

			Killed	Wounded	Injured in action
Officers .. ..	..	..	3	19	—
Other ranks ..	..	..	22	92	19
			—	—	—
Totals .. ..	..	..	25	111	19

My thanks are due to Lieutenant-General Sir John G. Dill, K.C.B., C.M.G., D.S.O., for permission to publish this article and I am indebted to Lieutenant-Colonel R. Elsdale, O.B.E., M.C., Royal Corps of Signals, for the photograph of the Camp.

DISCUSSION ON THE EFFECT OF AURAL CONDITIONS ON FITNESS FOR ACTIVE SERVICE.

[Contributions to the Discussion on the Effects of Aural Conditions on Fitness for Active Service at a Joint Meeting of the United Services and Otological Sections of the Royal Society of Medicine, held on February 5, 1937. Printed by permission of the Honorary Editors. For a report of this Discussion see *Proc. Roy. Soc. Med.*, vol. xxx, p. 1523 Joint Discussion, No. 6.]

AURAL REQUIREMENTS OF THE REGULAR ARMY IN TIME OF PEACE.

By MAJOR JOHN HARE, O.B.E.

Royal Army Medical Corps (R.P.).

ACCORDING to Army regulations, all officers and men serving in the regular Army must be fit for active service in any part of the world.

My remarks will be confined to the aural requirements of the regular Army in time of peace. Major Waggett will deal with the war aspect.

My main object is to attempt to prove by means of graphs and official figures that the present aural policy in the Army, adopted in 1926-27, has thoroughly justified itself by results and, therefore, to recommend its retention.

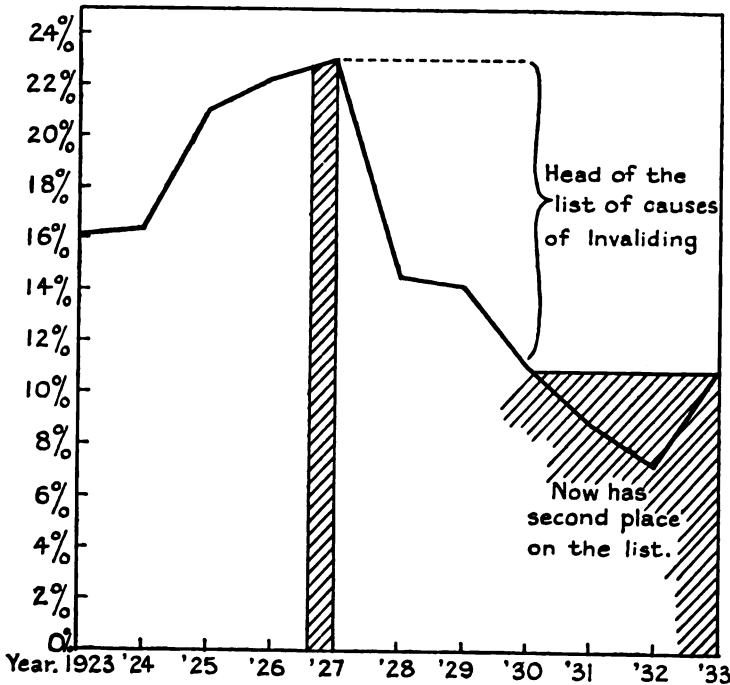
My purpose can be most usefully served by giving a brief history of the various aural standards in force in the Army since the year 1921. Before this date medical examiners of recruits were only required to ascertain if the hearing was good. In 1921, and because the incidence of aural disease was becoming serious, medical examiners of recruits were instructed to reject any recruit suffering from otitis media or a perforation of the drum. It is necessary to state here that the only instrument then issued to medical examiners of recruits was the non-electrical Brunton auriscope. At this time the electrical auriscope was non-existent.

As the aural position in the Army did not improve, but rather grew worse, the Conway Committee was formed by the War Office with terms of reference "High incidence of aural disease in recruits". Graph A shows that from the year 1919 to 1930 aural disease headed the list of main causes of invaliding from the Army, the second place being occupied by tuberculosis. The chief result emanating from this inquiry was that the recruiting regulations then in force were altered to exclude those men who were found to be suffering from a chronic meatal dermatitis, or who had undergone a radical mastoid operation.

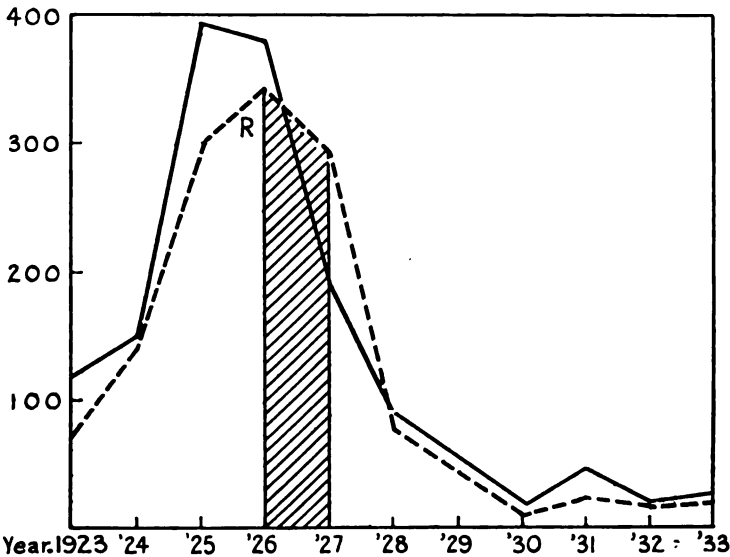
Graph B shows that, despite this innovation, the aural position became so serious that during the year 1926 almost 400 men were invalided from India on account of chronic suppurative otitis media. Although this enormous rise was not entirely a true one, it was nevertheless true to the extent that this number of men were discovered to be suffering from this disease in India. Previous to this time it is highly probable that the disease was just as prevalent but fewer men were invalided and a greater number were allowed to serve on.

The aural position still remained a very serious one but had a happy result in calling for a further and immediate investigation.

The problem was referred to Major E. B. Waggett, C.B.E., D.S.O. (at that time Consulting Aurist to the War Office) and myself (in the capacity of Aural Specialist to Millbank Military Hospital) by General West, then Consulting-Surgeon to the Army, and we gave it as our considered opinion that the great majority of the cases invalided from India were not cases of aural disease occurring *de novo* in India, but were chiefly in men who had managed to get abroad through evading the aural vigilance of the recruiting medical examiners at home. This contention was fully borne out



GRAPH A, showing the percentage of men invalidated annually, suffering from aural disease, of the total invalidated from *all* causes. (Figures provided by the Annual Reports on the Health of the Army, years 1923-1933.)*



GRAPH B, illustrating the total number of men invalidated annually from India, suffering from aural disease. Continuous line—number invalidated to the United Kingdom. Broken line—number permanently invalidated from the Service.

* In all the graphs the period of my tour of inspection followed by the introduction of the electrical auriscope is denoted by the shaded column.

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by the results obtained by me on a tour of inspection of all the depots in the British Isles, in which I examined and reported on the condition of the ears of every serving recruit. In all I examined 8,533 recruits (or 17,066 ears), and of these, 316 men—i.e. about 4%—were found to be suffering from unsuspected otitis media and were at once discharged from the service as unfit (*see* Table I).

TABLE I.—AURAL INSPECTION OF ALL RECRUITS UNDER SIX MONTHS' SERVICE IN COMMANDS AT HOME

Name of command	Total number of recruits examined	Number immediately discharged as unfit on A.F.s B204 and B179 inclusive	Number ear-marked for admission to hospital	Total found to be suffering from aural disease	Cases admitted to hospital for treatment				Total Number discharged as permanently unfit	permanently unfit of total examined	recruits examined found to be suffering from aural disease
					Number actually treated	Number discharged on A.F.s B204 and B179	Number returned to duty as fit	Number remaining under treatment			
Eastern	3,000	63 (2)	15	78	10	4	6	—	67	2.2	2.6
Southern	1,713	50 (10)	23	73	23	18	5	—	68	4.0	4.2
Northern	1,273	60 (2)	37	77	37	13	24	—	73	5.7	7.6
Western	978	34	26	60	26	12	13	1	46	4.7	6.1
Scottish	787	41	16	57	15	3	12	—	44	5.6	7.2
Aldershot	667	11	11	22	8	3	2	3	14	2.1	3.3
N. Ireland	115	3	2	5	2	1	1	—	4	3.5	4.4
Totals	8,533	262	130	372	121	54	63	4	316		

It was found that the main reason why medical examiners of recruits were failing to detect aural disease, if present, was inadequate instrumentation. The Gallie Committee was then set up by the War Office to consider the situation and my interim reports, and its resultant recommendations were in the main as follows :—

(1) The immediate circularization by pamphlet of all medical examiners of recruits, emphasizing the seriousness of the aural position in the Army and stressing the fact that this position had mainly arisen through lack of care on their part in detecting aural disease, when present, and demanding that more care be exercised in the future. Further, it was stated that their work in this regard would be facilitated by

(2) The universal issue of electrical auriscopes to all those whose duty was or included the medical examination of recruits.

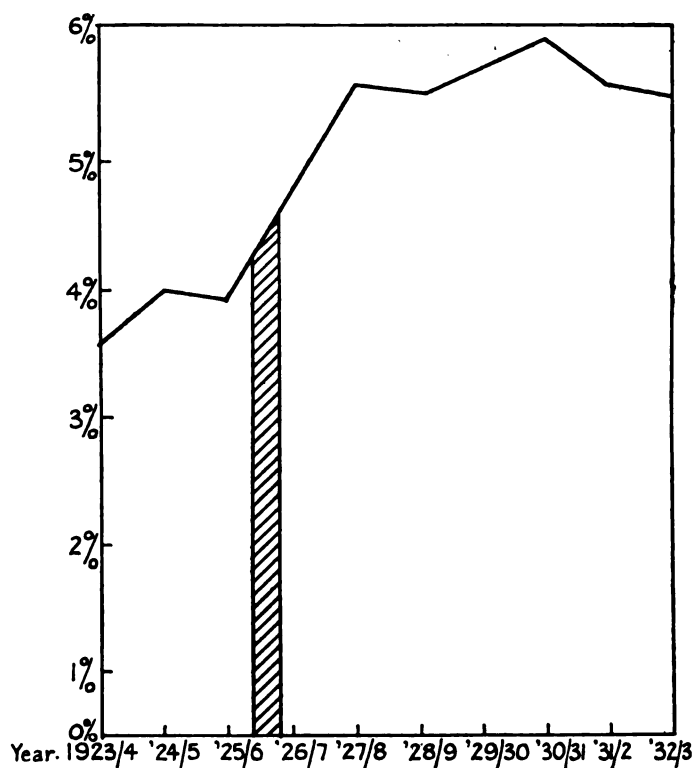
During my tour of inspection one of my chief and most important duties was to demonstrate to medical officers the lesions found and which demanded rejection.

TABLE II.

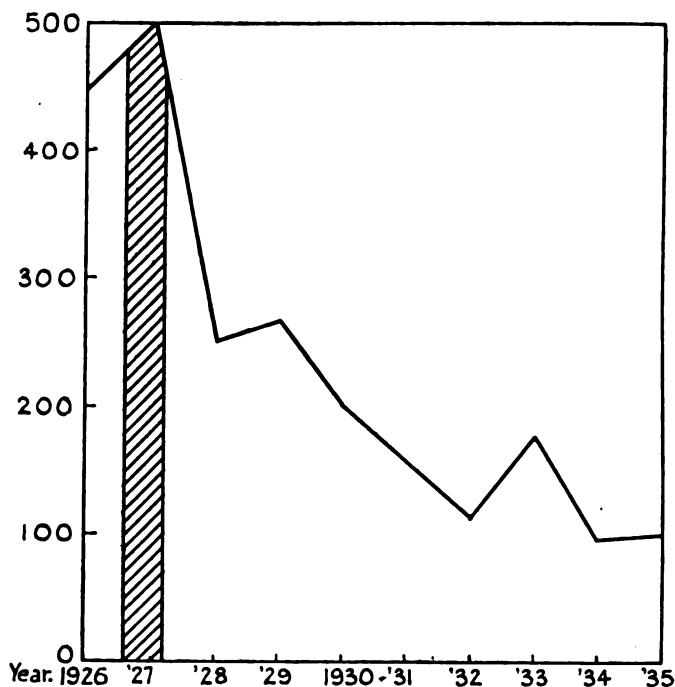
Year	Total number of invalids from all cases discharged during the year	Number discharged on account of aural disease	Percentage
1923	2,778	451	16.2
1924	2,500	409	16.3
1925	2,152	449	20.9
1926	2,029	454	22.3
1927	2,138	500	23.4
1928	1,661	246	14.8
1929	1,808	260	14.3
1930	1,655	182	10.9
1931	1,487	131	8.8
1932	1,439	112	7.7
1933	1,523	168	11.0

1932 showed a reduction of about 66%.

Graphs C and D and Table II show how immediately effective the above recommendations were and have happily continued to be. In consequence, in the year 1930, for the first time since the Great War, invaliding from aural disease fell from first place to second in the list of causes of invaliding, and has since remained in this improved position.



GRAPH C, showing the immediate and sustained rise in the percentage number of recruits rejected on account of aural disease since the date of the War Office Enquiry in 1926-27, and the introduction of the electrical auriroscope.

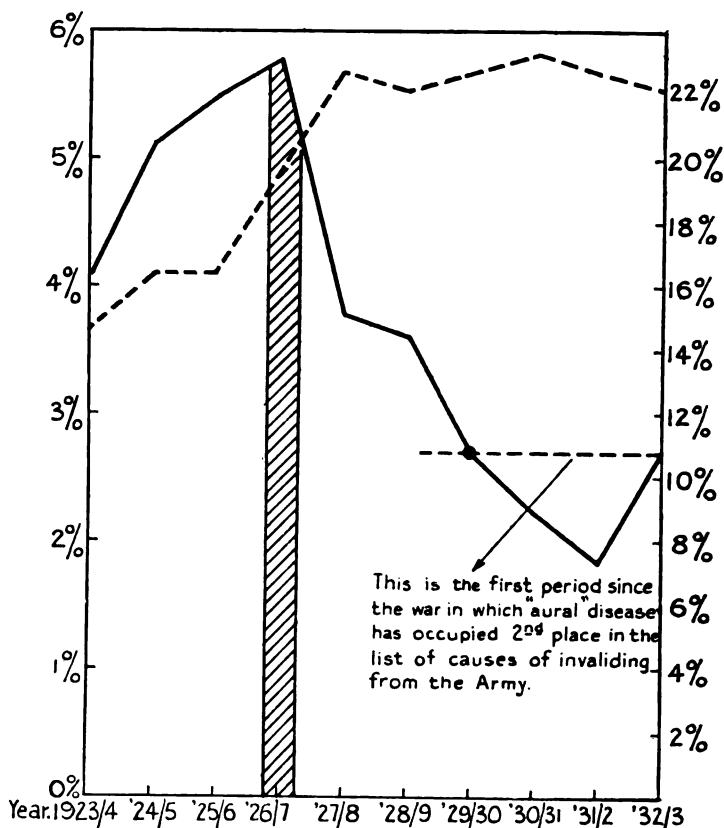


GRAPH D, period 1926-35, showing the great decrease in the number of invalids finally discharged on account of aural disease. Figures for the British Army at home and abroad, including India.

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The combined Graph E is interesting in showing how, as the number of recruits annually rejected at home because of aural disease has risen, at the same time the number of men invalided from the Army from the same cause has fallen.

It is further of interest to examine Graph F, which shows that the number of men constantly sick from diseases of the ears and nose remained at a fairly steady level during the whole period under discussion. As during this period a tremendous number of men were invalided home suffering from otitis media, it is safe to assume that the majority of cases in India are of external otitis rather than otitis media. As in all

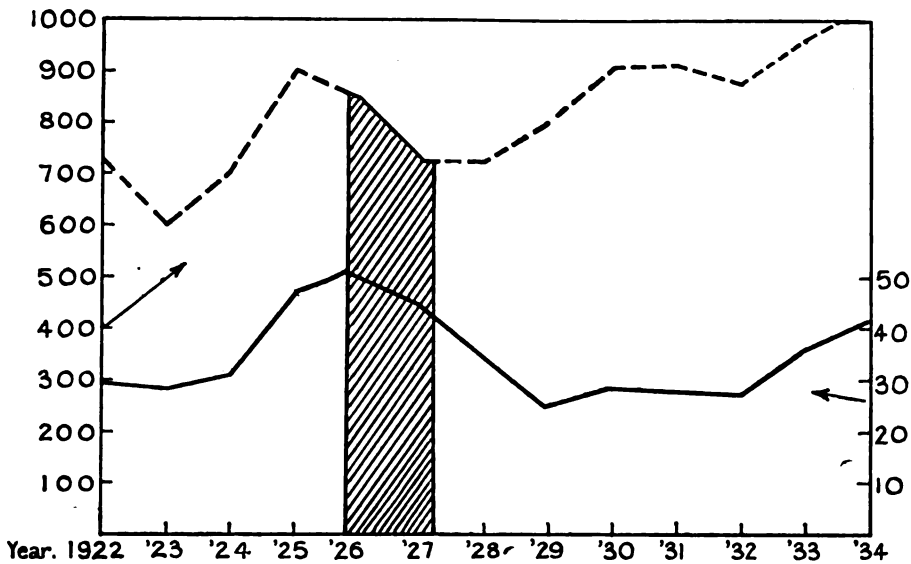


GRAPH E.—Broken line represents the percentage of the total number of recruits presenting themselves for medical examination "at home" who were not accepted on account of aural disease.

Continuous line represents the percentage discharged owing to aural disease of the total number of invalids discharged "from all causes".

tropical climates, of course, external otitis is extremely prevalent, and accounts for a great loss of working time and efficiency, through hospital attendance or admission.

It will be generally agreed that the results of adopting the recommendations of the Gallie Committee are very good and striking, as demonstrated by Graph B, which shows that whereas nearly 400 men were invalided from India in the year 1926 there was a fall in the year 1930 to the very low figure of 13, which satisfactory low level is being maintained. This would seem a matter for congratulation, but it must be realized that the present strict aural standard now in force which has brought about this commendable state of affairs results annually in a great loss of potential recruits



GRAPH F.—India. Broken line = number admitted to hospital annually suffering from diseases of the ears and nose.

Continuous line = number constantly sick from diseases of the ears and nose.

for the Army, in fact 3,000 men a year, or approximately 6% of the total number of recruits presenting themselves for enlistment (*see* Table III).

TABLE III.—MEDICAL EXAMINATION OF RECRUITS AT HOME.

Year	Number of prospective recruits examined by E.M.O.s	Rejected on account of ear trouble Number rejected on primary examination	Number rejected within 6 months	Total	Percentage
1931/32	54,169	2,773* 220†	284 6	3,283	6.06
1932/33	56,768	2,914* 213†	261 5	3,393	5.97
1933/34	47,392	2,261* 179†	203 4	2,647	5.58
1934/35	45,200	2,202* 167†	284 5	2,658	5.88
Total ...	203,519			Total ... 11,981	

* Diseases of middle ear.

† Other diseases of the ear

The present aural requirements in a recruit are as follows : A recruit shall not be enlisted who suffers from any of the following defects :—

- (1) Deafness, as defined below.
- (2) Perforation with or without discharge from the middle ear.
- (3) The presence of polypus or granulations.
- (4) Post-aural scar with absence of the drum, indicative of a radical mastoid operation (a simple mastoid operation with healed intact drum and good hearing is no bar to enlistment and all such should be accepted).
- (5) Dermatitis of the meatus (eczematous or desquamative).

The following will be taken to constitute deafness : Inability to hear with either ear, at a distance of 20 ft., a series of numbers including at random intervals the figures 66 (high note), 25 (medium note), and 44 (low note) uttered in a strong whisper.

The examination will consist of two parts (of which the former is considered the more important) : (1) Auriscopic scrutiny, (2) a hearing test, as above.

To those unaware of the conditions of service in the regular Army this wholesale rejection of men who are found to be suffering from a perforated ear-drum, but who have adequate hearing, would seem to be an act of extreme folly to say the least, especially when it is taken into consideration that these men were found to be otherwise healthy and fit for enlistment. It has, however, already been shown how prevalent external otitis is among troops serving abroad. Given a tympanic cavity vulnerable to infection by virtue of an unhealed perforation, an infection of the tympanic mucosa occurs in the great majority of cases. This re-infection proves very resistant to treatment under tropical conditions and consequently a high percentage of those afflicted are invalided annually to the United Kingdom. This results in the loss of a great number of trained soldiers to the Army and a great financial loss to the State. To a lesser extent the same consideration applies regarding service at home, in that re-infection of the tympanum in the presence of a perforation frequently occurs at bathing parades, which are a compulsory exercise, in spite of measures taken to prevent such an occurrence.

In conclusion, therefore, it is contended that conditions of service being what they are in the regular Army, which requires a man to be fit for service in any part of the world, the present aural standard should be adhered to and that, although it might be criticized as being too strict in its requirements, results have amply justified its adoption and retention.

"EARS" ON ACTIVE SERVICE.

By MAJOR E. B. WAGGETT, C.B.E., D.S.O.

Consulting Aural Surgeon, Charing Cross Hospital.

I shall confine my remarks, in the main, to ear conditions in an army on active service: if my thesis is maintained, details of army recruiting regulations for national emergency follow as a rational consequence. And I speak as a soldier—that is to say I do not regard a period of active service as a suitable occasion for the performance of operations and elaborate treatments proper enough in peace time. The function of a medical officer in war is to keep fighting units as near up to strength as in him lies.

I shall attempt to show that the prominence accorded to ear disease in the Army of 1914–18 was quite unnecessary and grossly exaggerated, and this was owing to the fact that medical officers were unfamiliar with the elements of otology and anticipated grave complications in all cases of otorrhœa. In any future national war we may look forward to a much more favourable state of things, for otology has now become compulsory for the qualifying examinations of the R.C.P. and the R.C.S., while the largely increased numbers of genuine aurists should supply an expert, at least, to every casualty clearing station.

The aural invaliding and recruiting crisis into which Major Hare and myself were detailed to inquire a few years ago was really a financial affair and somewhat different from our present problem, but certain points in Major Hare's results are worthy of special notice here. Of genuine ear cases, 90% of the men heard quite well on parade. In a certain year, India sent back invalided 404 ear cases. They were nearly all old perforation cases with mucopurulent catarrh set up by Service conditions, notably by compulsory bathing. It was then arranged that no man with a perforation should bathe without an ear-plug and a subsequent visit to the unit inspection room for the instillation of biniodide and spirit drops. The invaliding dropped to 13, and has remained thereabouts. The most important point for us in Major Hare's report is that if all applicants with ear trouble were rejected by the recruiting medical officer, we should lose at least 6%—he estimated at the time that the figure would be 10%.

—of the total applicants. In recruiting on a national scale we cannot afford to reject anything like that percentage merely for ear trouble, nor is there any necessity to do so, as I hope to show. For pension purposes a record of aural defects should be made at the time of recruiting.

My own experience is that of an aurist with twenty years' civil hospital practice, acting for four years as an executive officer in a field ambulance, and therefore in touch with the fighting formations. In 1915 a field ambulance was a big affair, in our case (85 F. A., 28 Div.) occupying a great building, and alternately with one sister ambulance taking in all cases from half the Ypres salient, often from 400 to 1,000 a night, and retaining large numbers until their return to the firing line; for we had some first-rate surgeons and physicians among the officers.

After several months of this service I received an unofficial letter from the Statistical Office asking how I explained the enormous influx of ear cases to the base. I replied that I was amazed at the query, for I had seen no single ear case worthy of sending down the line—and the wet trenches round Ypres were no health resort!

At the end of 1915 the division went to the Balkans. There the field ambulance served 6,000 troops, often retaining 500 sick cases from start to finish; sending them back after convalescence to their units. During three years of that service we sent down exactly two ear cases—one, after a hurried glance, just before a battle, and one for vaccine treatment against recurrent furunculosis. Every day a corporal would be seen treating three or four cases of catarrhal discharge and sending the men off to their units with drops or powders, to return in a week; a loss to the force of say, twelve hours in all, spread over four weeks.

During a period of about six months, in the absence on sick leave of the throat-and-ear consultant, I went down to Salonika once a fortnight to help the eye consultant who had taken over the department. During that period I operated on one doubtful mastoid, a case which, as it proved, required no operation, but I did not care to leave it until my next visit.

I have related the four years' experience of active service in two remarkably unhealthy terrains—the experience of an aurist, that is to say, of a medical officer who recognizes in discharging ears the immense difference between an antero-inferior perforation and one in the postero-superior quarter. Is it too much to ask to-day, that every field ambulance should have one officer capable of making this easy distinction? Experience of 1917–18 tells us that we cannot afford in national emergency to reject recruits for slight defects, and all aurists will agree that old perforation cases under exposure will from time to time show a discharge which clears up in about three weeks, with the simplest conservative treatment in the case of antero-inferior perforations. Every civil out-patient room holds numbers of such cases daily, but the subjects do not dream of going sick and stopping work. Some such cases urgently need pharyngeal or nasal interference. In point of fact, I did not see one such case during the four years.

Also I would urge that there should be a genuine throat-and-ear specialist at each casualty clearing station. He will get very little important ear practice, but he can make himself quite useful in other ways. He can tie arteries and cut off limbs quite efficiently, and his experience of cranial surgery will probably exceed that of his brother officers. In the German push of 1918 I served in a C.C.S. in France for some weeks, and three or four head cases were detailed to my operating table every night. An aurist in a C.C.S. will prevent these mild ear cases getting past railroad to the base. I think all front-line medical officers will agree that once a man gets to the base they will not see him again for two months; he will come back soft, undisciplined, and lacking *esprit de corps*, and it will take a further three weeks for him to shake down again. The authorities need not fear aural pension troubles if records are taken in the recruiting office. Drumheads ruptured by explosion are best left strictly alone, while cochlear concussions gain nothing from the aurist.

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As I have been privileged in the past to advise the Army Medical Department on aural regulations for peace-time recruiting, may I make some suggestions for mass recruiting in national emergency ?

That hearing of forced whisper at 10 ft., with the back turned to the examiner, should suffice for general service.

That an inspection of the drumhead should be made in all cases; an interval of half an hour should elapse after syringing for wax. The electric auriscope facilitates examination for medical officers unused to the forehead-mirror.

That a man with aural discharge, whether meatal or tympanic, should be directed to a civil hospital, to return in two months for re-examination.

That all candidates with dry perforations should be accepted for general service, provided the perforations are not in the postero-superior quarter.

That otherwise desirable applicants who have dry postero-superior perforations (i.e. free from granulations) should be accepted for permanent base (where they will do just as well as in civil life).

That in conservative mastoid cases with healed drums and at least six months' "dry" history, the men should be accepted for general service, and that in radical mastoid cases with twelve months' "dry" history, they should be accepted for permanent base.

That men with intact drums but with defective hearing, tinnitus, vertigo, or paracusis, should be examined by an aural specialist, as a precaution in regard to pensions.

That cases of atresia and of marked hyperostosis should be rejected.

That all functional or structural ear defects in men accepted should be recorded as a pension precaution.

INTERNAL DERANGEMENT OF THE KNEE-JOINT.¹

By MAJOR M. MORRIS,
Royal Army Medical Corps.

THE unfortunate phrase "internal derangement of the knee-joint" has crept into surgical nomenclature purely as a result of the difficulty in arriving at an exact diagnosis in so many conditions arising in the knee-joint. By many surgeons the phrase is used as denoting that the patient has a loose internal or external semilunar cartilage, by others it applies or is used as a diagnosis for many conditions. I have decided to bring this subject to your notice because I see an enormous number of these cases. In these days physical fitness plays such an enormous part in the lives of adult men and women that knee trouble is very common as a result of their efforts to maintain fitness. Knee troubles are commoner amongst Europeans than Indians, and are a serious menace to the man power of the Services both at home and abroad. In 1934, in Bangalore, forty-two cases were admitted to the British Military Hospital and twenty-one were operated on. In the Indian Military Hospital twenty-two cases were admitted and eleven operated on. In the Army at home 203 cases were operated on in the year. I shall in this paper confine my remarks to the commoner traumatic lesions of the knee, their diagnosis and treatment, and regret that time will only allow me merely to touch upon the fringes of this interesting subject.

The knee is especially liable to derangement on account of its mechanical weakness relative to the important work demanded from it. It is mechanically a bad joint because, enfeebled by the inward angling that normally occurs there, the weight of the body transmitted through a line that falls to the lateral side of the mid-point of the articulation causes undue strain to be thrown on the internal lateral ligament and the structures in relation with it, such as the coronary ligament and the internal semilunar cartilage. The flatness of the articular surface of the tibia and its looseness of articulation with the condyles of the femur strongly predispose to the sliding of the joint, which is only controlled by ligamentous and muscular strength and tone.

The powerful crucial ligaments have an important function in this connexion; it will be remembered that the anterior crucial ligament is tense during extension of the knee, and that it prevents excessive extension; it is attached above to the posterior part of the inner aspect of the external condyle, and below to the upper aspect of the tibia in front of the tibial

¹ A paper read as President of the Surgical Section, Mysore Medical Association, Madras District, at the Association's Annual Congress.

spine and either in front of or just mesial to the anterior corner of the external meniscus. The posterior crucial ligament, on the other hand, is taut in flexion ; it is attached above and in front to the anterior part of the lateral aspect of the internal condyle of the femur, and runs backwards to be inserted in the mid-line of the joint into the most posterior part of the upper tibial surface and to the posterior surface of the tibia for about a quarter of an inch. Rupture of the crucial ligaments, therefore, produces a form of internal derangement that causes serious disability, difficult to cure. Much of the integrity of the knee depends on the internal lateral ligament, which is attached above to the internal epicondyle of the femur just below the adductor tubercle, and divides below into two bands, a short or posterior one that inclines slightly backwards to its insertion into the medial aspect of the tibia proximal to the groove for the semi-membranous tendon, and a long or anterior band that passes slightly forwards to secure a long attachment to the medial surface of the tibia just below and behind the level of the tuberosity. Tears of this ligament are apt to occur either alone or in association with damage to the internal meniscus. The synovial membrane of the knee is a complicated one with numerous folds and fringes ; in some of these, notably behind and at the medial side of the patella, fibro-fatty tissue is apt to accumulate, especially in joints affected with rheumatoid arthritis and osteoarthritis ; nipping of these fringes cause a minor but troublesome derangement. Naturally, freedom from nipping of synovial membrane during violent extensor movements, as in kicking, is secured by the action of the subcrureus muscle, working co-ordinately and simultaneously with the crureus and other parts of the quadriceps extensor ; patients with inco-ordinate, ill-developed or paralysed subcrurei are therefore liable to nipping of the synovial membrane when the leg is thrown forward when walking. I have come to regard the tone and development of the quadriceps as of great prognostic importance in cases of internal derangement, for not only is this action in preventing nipping important, but the knee depends for much of its integrity and solidity not only on its ligamentous strength but on the strength, tone and co-ordination of all the muscles playing over it ; and of these the quadriceps is the most likely to go wrong. Almost any alteration in the normal intra-articular arrangements may render the joint liable to those recurrent attacks of sudden pain, usually followed by synovial effusion, the causes of which have been grouped under the title "internal derangement of the knee." Amongst the commonest causes are: (1) A crucial ligament may be torn or separated from one of its attachments and cause weakness of the joint and sliding of its component bones one on another ; (2) the internal lateral ligament may be lacerated or stretched and may imperfectly perform its binding function ; (3) an intra-articular cartilage may be ruptured or distorted and become liable to nipping when sudden movements are made ; (4) the offending body subjected to pressure may be a loose small fragment of bone and cartilage, separated by fracture ; (5) an osteo-

arthritic-osteophyte detached from its bony base and loose or swinging on a fibrous pedicle; (6) an hypertrophied synovial villus that has become bulbous and pedunculated; (7) a thickened or lipomatous synovial fringe; and (8) a loose melon seed body (rice body) composed of concentric laminæ or fibrin.

Occasionally similar symptoms may be due to trapping of the synovial fold during a sudden movement; thus in sudden extension of the knee partly performed by the swinging of the leg (as when a patient with incomplete muscular tone and co-ordination kicks forward violently) the subcrureus fibres may fail to pull out the synovial membrane from between the bones in time. Analogous effects are sometimes seen in patients with paralysed muscles and weakened internal lateral ligaments.

Lacerations and displacements of the semilunar cartilages, frequently encountered in young adults, especially athletic males, are primarily due to trauma. In flexion of the knee the menisci slide to some extent with the femoral condyles, and also rotation, which cannot occur in the extended position, becomes possible; it is some sudden movement of flexion with rotation, insufficiently governed by bracing of the muscles, that permits tearing of the menisci.

During some violent jumping or turning movement, or as the result of stubbing the out-turned toe against a fixed object and thus throwing the whole body-weight forward, the leg is suddenly rotated on the thigh while the knee is flexed. As a result a semilunar cartilage, usually the internal, is injured. The primary accident may be a simple mis-step. The damage to the cartilage may consist of an oblique split, frequently into its anterior end, or of a partial or complete transverse tear, or of a complete separation from all anterior attachments. The detached portion may slip in and out between the joint surfaces, and therefore be liable to be frequently trapped, or it may be folded over to form a definite thickening. In old standing cases the cartilage degenerates, becomes friable, and may almost disappear, while the pressure of a twisted or folded semilunar cartilage may cause erosion of the articular cartilage on the femoral condyle or the upper aspect of the tibia. Associated partial laceration of the internal lateral ligament is extremely common; it may be severe or may merely consist of some separation of its fibres; the capsule is often torn at the same time.

Clinical Features.—In the most typical cases, at the time of the primary accident the patient suffers a sudden, severe, and peculiarly nauseating pain in the knee, and may fall to the ground with the knee flexed. On attempting to stand he cannot immediately extend the knee or bear weight on the limb. When the internal semilunar is the one damaged, there is tenderness over the internal lateral ligament, either along joint line or at the upper or lower attachment of the ligament. The displaced cartilage can sometimes be felt, but it is usually dislocated towards the centre rather than to the periphery of the joint.

By swinging the leg at the knee the patient sometimes snaps the

cartilage back into place; but often he cannot fully extend the leg until the surgeon has replaced the cartilage. A synovial effusion follows which may entail from six to eight weeks' rest.

The onset is not always so dramatic, and definite "locking" may not be prominent. But nearly always a history of some accident can be elicited, even if it consists only of a fall on the feet, followed by local tenderness and pain on movement or on bearing weight.

The first attack may be the last, but too often it leads to others. The weakening of the joint, especially of its internal lateral ligament, by the trauma and by the presence of the effusion predisposes to further injury; the loose cartilage may be nipped so often and so readily that the patient cannot even walk with safety. Muscular atony and atrophy occur, especially in the quadriceps extensor muscle, and with the ligamentous laxity, permit undue lateral mobility of the joint. After damage to the internal meniscus, a point of tenderness often persists at a site just above the upper margin of the tibia and about half-way between the inner margin of the ligamentum patellæ and the internal tuberosity of the tibia.

Prognosis is poor and recurrence is almost always constant in adults with athletic tendencies or with livings to earn on their feet.

Treatment.—If reduction has not already taken place as a result of the patient's efforts or those of his friends, the cartilage must be replaced by full flexion followed by extension and rotation of the knee. In many cases an anæsthetic is necessary.

The synovial effusion if at all pronounced should, in my opinion, be treated by aspiration. This definitely limits the time of convalescence and later damage to ligaments and muscles round the joint. Aspiration should be done in the theatre with the same precautions as a radical knee operation. The quadriceps muscle must be placed in the hands of the electro-therapeutic department from the first. The knee is kept between sand-bags, tightly bandaged until effusion, pain and tenderness have vanished and the patient after some fourteen days is allowed to commence exercises of a nature not more strenuous than walking or cycling.

Generally the condition calls for operation, especially in patients with occupations in which a sudden fall or turn may be expected. If operation is delayed the subsequent permanent damage to the knee and its supporting structure must be pointed out.

I do not intend to weary you with the technique of the most successful and safe operation of meniscotomy. I would draw attention to the fact that convalescence is in my opinion no longer after the operation than in non-operative treatment. It cures 97 per cent of cases and the allied conditions of nipped fringes, small foreign bodies, sub-patella pads of fat causing trouble so frequently associated with the mobile cartilage and discovered only at the operation, can be dealt with.

Rupture of crucial ligaments generally results from great violence and is associated in many cases with fracture of the tibial spine. Pain is great

and movements are abnormally free and partial luxation backwards or laterally may be demonstrated.

Treatment consists of absolute immobility of the joint for a prolonged period followed by the wearing of an apparatus for limiting flexion for some months.

I am unable to express an opinion on repair or reconstitution of the ligaments by open operation, but understand that there is a considerable variation in opinion as to the success of these operations. In any case they should not be undertaken except in chronic cases. All knee cases with a history of trauma must in these days be X-rayed. It is always sound to X-ray both knees and an antero-posterior and lateral view should be taken and the two sides compared. You will find that radiological evidence of cartilage trouble is rarely met with and the chief value of radiology lies in the demonstration of injury to the tibial spine, of foreign bodies, and osteo-arthritic changes, etc.

In all cases dealt with, either by operation or other treatment, I lay stress on the fact that unless the musculature of the thigh is kept in good condition by electricity, hot baths, radiant heat, massage, etc., and later by exercises, and cycling, results, although apparently excellent from a purely surgical point of view, will functionally be poor. I must finally draw your attention to the fact that the diagnosis "internal derangement of the knee-joint" has for some years been deleted from the Nomenclature of Diseases drawn up by the joint committee of the Royal College of Physicians of London.

NOTES ON SOME ORGANIC CONDITIONS ASSOCIATED WITH MENTAL DISEASE.

BY MAJOR G. W. WILL, O.B.E.

Royal Army Medical Corps.

(1) IMPACTED WISDOM TEETH.

SINCE publishing a case in the June number of this Journal my attention has been further drawn to this condition.

Firstly—why “wisdom teeth?” It suggests that, through the ages, the non-appearance of these teeth has been associated with abnormal or unwise conduct. An excuse for the sowing of wild oats has always been, “Oh, he is only cutting his wisdom teeth!” Once these were safely erupted the individual could then be regarded as having attained a normal stability. Such beliefs as this, arising when the observation of clinical facts was more accurate than it is at present, often embody truths whose importance is not now realized.

I am now able to report, very briefly, some further cases where unerupted wisdom teeth have been found associated with abnormal behaviour. In none of these cases can the results of treatment yet be stated and I do no more than mention the association, hoping thereby to call attention to the necessity of further investigation of this condition.

Case “T.” Invalided from India as epileptic psychosis (epileptic equivalents). History of several military offences associated with amnesia. Two lower impacted wisdoms were removed by Captain McCarthy at Colaba. Four months later the patient appeared normal and there had been no more symptoms.

Case “H.” Admitted for observation following instances of exhibitionism. The patient described the offence as taking place in a condition of clouded consciousness or fugue. Both lower wisdoms were impacted and the right upper partially so. Treatment has been carried out but it is too early to give any opinion as to the result.

Case “B” was a somnambulist whose nocturnal episodes appeared almost epileptiform in nature. He shouted and struggled but always had complete amnesia for the attacks next morning. The upper wisdoms were unerupted but not impacted, while both lower were unerupted and impacted. The lower jaw was very underhung and there was crowding of the teeth. As he was barely up to physical standard and had less than a month’s service he was not retained.

Case “M.” This man enlisted after escaping from a Mental Defective Colony to which he had been admitted on August 23, 1936. He was then described as “a feeble-minded person, abnormally dull, stupid, ignorant.

childish in manner and lacking self control." After serving successfully for five months he was admitted to "D" Block for observation on June 4, 1937. His Depot instructor in Physical Training had reported him as "exceptionally clean, hardworking, and far above the average." The instructor in Education reported him as "dull, with very poor power of retention, and making no progress." Both lower wisdoms were shown by X-ray as unerupted and impacted. Visual inspection showed that in both the posterior cusps are just through the gum. His mental condition appears to be improving *pari passu* with the eruption of his wisdom teeth.

It is not possible to generalize on five cases but these five do suggest two lines of thought.

(1) The impacted wisdom teeth are a localized defect and their pressure sets up stimuli which have either a reflex or a direct effect upon the central nervous system. If this be so, their removal—or the removal of the second molar—would remove the pressure and cure the conditions, both local and remote.

(2) The impacted teeth are part of a general developmental defect and treatment therefore cannot be curative.

That impaction of wisdom teeth is a developmental defect appears indisputable—my own opinion is that it may, and does, appear as an isolated phenomenon. I regard my June case as an example of this. In cases "T" and "H" I make no comment, while in cases "B" and "M" I regard the impaction as part of a generalized defect. In case "B" I anticipate that treatment will be followed by improvement. Case "M" is a very interesting one, it looks as though the cutting of the wisdom teeth were actually bringing wisdom.

Three cases were associated with automatic behaviour or fugue. Two other recent cases of such behaviour had not impacted or even unerupted wisdoms. An attack of "loss of memory" which may be a fugue, an epileptic equivalent, an hysterical attack, or the like, is a frequent excuse for military delinquency. Should it become established that such instances of abnormal conduct are associated with impacted wisdom teeth the defence at a trial by Court Martial may have a very powerful weapon. This aspect of the case, alone, justifies further investigation. I know of no more difficult case to deal with than a "loss of memory." A man who absents himself from the pay parade and walks off, dressed only in shirt and trousers, across the Bombay Deccan on a monsoon afternoon and then says he remembers nothing about it may, presumably, be regarded as genuine. A man who is found in the stokehold of a steamer in the Bombay docks may, if he says he does not remember how he got there, be called a liar without much fear of an action for defamation of character. Between these two extremes one meets a varied assortment of cases and it is in these that the investigation of a possible organic cause is so important. I believe that the majority are hysterical. Cysticercosis is a recognized cause of mental abnormality and should be excluded. I once suggested a

calcified choreoidal plexus as a possible cause and no one has yet been able to give me a convincing reason for discarding such an hypothesis. I now suggest that the possible role played by impacted wisdom teeth should be considered.

I do not propose to discuss here dental sepsis or sepsis of tonsils and accessory sinuses, frequently found associated with impacted wisdoms, except to say that symptoms from impacted teeth do occur in the absence of sepsis. I have seen great improvement in confusional cases following the extraction of teeth with localized apical abscesses. In the absence of febrile reaction, leucocytosis, and other evidences of systemic infection it might well be that the mental symptoms were due to the reflex effects of the pressure of the abscess in a confined space.

I am very much indebted to Major S. H. Woods of The Army Dental Corps for information on this subject and, in particular, for bringing to my notice the work done by Mr. C. Bowdler Henry, M.R.C.S.Eng., L.D.S. In an article in the *Lancet* of February 9, 1935, entitled, "Wisdom Teeth and their Complications," this writer describes a series of 622 cases. Neurological and mental symptoms occurred as follows :—

Referred neuralgia..	..	..	..	..	141 cases
Mental, nervous, etc.	..	..	..	..	75 ..
Headache, including migraine	..	..	..	..	45 ..
Epilepsy ..	..	..	..	..	7 ..

The mental and nervous cases were further subdivided.

Nervous breakdown..	..	..	..	..	32 cases
Depression..	..	..	..	..	15 ..
"Mental" ..	..	..	..	..	28 ..

A great deal of work is being done by the Joint Board of Research for Mental Disease (City and University of Birmingham). In the Annual Report issued by the Board of Control for 1935 it is mentioned that in 1934, there were admitted three cases where unerupted wisdom teeth were found and in whom their removal played a greater or lesser part in recovery.

(1) Headache and insomnia—attempted suicide by medinal.

(2) Nasopharyngeal sepsis with four impacted wisdoms—originally diagnosed dementia præcox.

(3) Unerupted and impacted right lower wisdom—confused, disorientated, and hallucinated.

These very brief references show the importance that is being attached to this condition.

Several cases of epilepsy have been reported and it is only logical to assume that epileptic equivalents, fugues and the like, can also be due to impacted wisdoms and might similarly be cured by the active intervention of the Dental Surgeon.

(2) SOME CASES OF ACUTE MENTAL DISEASE ASSOCIATED WITH
INFECTIVE ILLNESS.

Among the outstanding examples of mental disorder associated with acute infective illness are the delirium in pneumonia; the mental confusion or delirium in a fever of the enteric group; and that form of delirium associated with alcohol. In all such cases the mental abnormality is purely temporary and is regarded as an "intoxication." Such cases are not necessarily regarded as "mental cases." A footnote to para. 527 Regulations for the Medical Services of the Army reads: "These instructions will not necessarily apply to cases of mental aberration due to trauma or to intoxication where the cause can be eliminated without leaving permanent serious effect."

I mention, very briefly, some cases where the symptoms of mental aberration appear to have been due to infective agents. With the exception of Case 1 these have been seen in "D" block between March and June of this year. They were noted as they were Boarded, and no attempt has yet been made to look up the records for similar cases.

Case 1.—An acute anxiety state following repeated attacks of bacillary dysentery associated with multiple boils. Complete recovery after three months in England.

Case 2.—An acute confusional state with increased psycho-motor activity, hallucinosis and imperception, following an attack of bacillary dysentery. Complete recovery within six months.

Case 3.—A depressed delusional state following ankylostomiasis with intensive treatment. Complete recovery within six months.

Case 4.—An acute confusional attack resembling an acute mania associated with malaria and its treatment by atabrin and plasmoquin. Complete recovery within six months.

Case 5.—An acute confusional state with gradual development of paranoid symptoms following repeated attacks of sandfly fever. The condition was progressive, and transfer to a civil mental hospital was necessary.

Case 6.—Schizophrenic symptoms with hallucinosis, confusion and motor restlessness starting on the tenth day of a moderately severe rubella. Complete recovery within a month.

Case 7.—General Paralysis of the Insane. This is in quite a different category, but the essential difference is that here we have a chronic, as distinguished from an acute, infection.

In all these cases (No. 7 excepted) the mental symptoms came on during or immediately after an acute illness which must be regarded as a causal factor. In their "Textbook of Psychiatry," Henderson and Gillespie say: "The relation of climate to the incidence of mental disorder is mostly a matter of the infectious agents, especially malaria, associated with tropical and semi-tropical countries." With this my experience is

in accord except that I regard dysentery as important a factor as malaria. I have seen more than one case of severe anxiety neurosis with a history of dysentery.

The depression following an acute attack of dengue has long been recognized as also that associated with sandfly fever; both of these can be very profound, but, fortunately, the effects are usually only temporary. The vendors of certain much advertised tonics would not receive dividends were it not for post-influenzal depression. I have seen many cases of mental trouble following, or accompanying, malaria infection apart from the acute signs in cerebral malaria. Sometimes quite a mild attack is associated with decided "queerness." In some obscure cases the administration of quinine has been followed by dramatic improvement.

An acute illness may not be the sole cause of a mental breakdown, but it often is one of the causes, and this should always be kept in mind when deciding on the course of action to be followed in any particular case.

A further cause for mental abnormality which merits attention is vitamin deficiency. The association of mental symptoms with pellagra has been noted, and I feel certain that this merits further research.

In all too many of the cases seen at "D" block, no evidence of any organic disease can be found. I am one of those who, while not a gross materialist, do believe that, in the future, we shall discover further organic causes for mental disease. In many cases the cause appears to be purely mental, and I feel that in some cases it is also spiritual.

I have to thank Colonel G. F. Rudkin, D.S.O., for permission to send the cases referred to for publication, and Lieutenant-Colonel C. J. Blaikie, R.A.M.C., for his assistance in the radiological investigations.

THE LOG OF THE "SEABIRD" OSPREY.

BY MAJOR E. F. W. MACKENZIE, O.B.E., M.C.

Royal Army Medical Corps.

(Continued from p. 249).

Dec. 12.—It continued to blow hard from the east all day yesterday, so I provisioned the boat in the afternoon preparatory for a cruise to Tadri River to-day. This is the farthest south I intend going as I must leave for Marmagoa on Monday 14th.

I left at dawn with a good breeze from the SE. and beat down the coast with two reefs. I got it pretty strong from outside Button Rock to Kawda Guda and beat into Belikeri for tiffin as I was making good going and it was too wet to eat at sea. A reef of rocks runs out from Belikeri Creek almost to Kuhra Island, but a passage can be made south of the Island. Belikeri Creek is shallow and narrow, and as it appears to have no attractions I did not enter it.

I had tea on the Gangawali River which has plenty of water over the bar for a small boat with one rock in the entrance, and which provides good shelter.

The only dangers inside appear to be the sandbanks which, I was told, frequently shift, and near the entrance are marked by sticks stuck in the sand as in the Sadashivgad River.

It must, however, be kept in mind that these beacons are usually planted in the dry edge of the bank at low water, and must therefore be given a wide berth. After tea I shook out the reefs as the breeze had moderated and was soon off Tadri River. Entrance to this river should be made from the south-west to avoid a reef running south from Middle Point, then by steering a course NE. under Rajaman Fort when two leading beacons on Rajaman Drug hill are in line.

Good anchorage was found off Tadri village in four fathoms mud, and here I am now lying.

I should like to visit Gokarn, on the coast 2 miles north of Tadri, where there are many temples and which is a place of pilgrimage for Brahmins, but I must get back to Karwar early to-morrow in order to refit for the homeward sail.

Dec. 12.—I left Tadri River at 5.30 a.m. and was guided out by the light on the flagstaff on Middle Point. There was a nice breeze from the south-west which came fresher across Belikeri Bay.

After reefing I made good going on a broad reach followed by a beat into Sadashivgad Bay and picked up my moorings at 1.30 p.m.

If these south-west winds continue I should make a good passage to Marmagoa to-morrow.

The coastline from Karwar Head to Tadri River is the most beautiful I have ever seen. The Ghats approach nearer the sea and appear higher and more blue than further north. The foothills rise in peaks as high as seventeen hundred feet almost to the coast, with Achuvi Peak, nearly 3,000 feet, and Kaltiguda, over 2,000, only a few miles inland. Along the shore from Karwar Head to Belikeri Point is a chain of very pretty islands which, if passage is made inside them, add greatly to the interest and beauty of the sail.

Dec. 14.—10.30 a.m.: Owing to delays in getting ready my fresh food for to-day I did not get away until 7.45, and so missed an hour of the land



Colla Bay.

breeze which was coming nicely from the SE. when I got my anchor. Crossing the bay it freshened considerably, and with a swell coming in from SW. and a choppy cross sea I was glad to put down a reef under the lee of Shimis Guda.

We went ramping along on a broad reach with the breeze backing a bit, passed Lolien Point at 9 a.m. and were off Paidegal Point at 10 o'clock—15 miles in 2 hours 15 minutes including time spent reefing. The breeze has now fallen light instead of holding until after midday, and as it has been a bright sunny morning with no cloud I am hoping for a good sea breeze.

5.30 p.m.: It fell dead calm shortly after my last entry, but in half an hour a light breeze came from NW. and I beat round Cape Ramas at 12.45, and at 2.15 was due west of Chandernat Temple 4 miles off shore.

The light breeze held all afternoon, backing to the north, and I am now 3 miles SE. of St. George's Island with little prospect of making Marmagoa to-night, so I have borne away for Colla Bay where I shall spend the night.

9.30 p.m.: There is excellent anchorage at Colla Bay in the first small cove east of Santaren Point. This bay is extremely pretty and the shores and hillsides are covered with groves of cocoanut palms. Two country boats are anchored close by and a little inshore are some canoes anchored in the bay fishing by torchlight, the brown figures looking weird and uncanny in the flickering light of their torches.

As I arrived early and had on board a dozen oysters from Oyster Rocks, I felt this was an occasion on which "Osprey" might show what she could do in the way of dinner and the following is the menu —

Huitres Oyster Rock,
Saumon de Phattar Frite,
Poulet en casserole,
Petit Pois,
Pechès à la crème.

The master was extremely pleased with the effort of the chef, and they are now on the best of good terms and about to retire.

Day's run 39½ miles.

Dec. 15.—Up early this morning and over the side before breakfast. The shore looked unusually enticing so I donned stockings and shoes and went for a tramp to explore the creek which the chart shows as entering the NE. corner of the bay. During the night I had been disturbed by a loud noise which I thought might be some mechanical device for unloading country craft, but which I later discovered to be the single-line railway which connects Marmagoa with the rest of India and which runs along the hillside close to the shore, though completely hidden by groves of palms. After a delightful walk through the palms, which are carefully cultivated and planted in successive terraces up the hillside, I emerged again into the sunlight at the end of a sandy beach which runs practically unbroken from Cape Ramas to Colla Bay, a distance of sixteen miles. Here I could find no signs of the creek, so made towards a gap in the trees where I found that, at this time of the year, it does not enter the sea. Surplus water evidently soaks through the sand of the beach. Once found the water is deep and clear, the river about 60 yards wide and overhung throughout by palms leaning across the water as though admiring their own reflections mirrored in the still surface. Through the clear water could be seen many shoals of fish of different kinds, some bright and silvery like sea fish and others of darker colour with stripes and markings of fish which live amongst the reeds of river banks. The largest, approaching 2 lb. in weight, closely resembled the English perch in shape and colour, and as they were not in the least alarmed by my presence on the bank would probably provide good sport for a skilful angler with a light rod.

During my walk back I saw many men climbing the palm trees and the numerous and large pots of foaming toddy proclaimed a thriving trade in the source of vitamins so essential to the well-being of the native. I set sail again at 11 a.m., and hope the morning breeze will take me to Marmagoa where I intend staying for a few days to enable me to visit old Goa.

Later.—Passing the headland I saw a towel waved and knew that an old friend, with whom I am to stay, had seen my arrival, but when within two cables of the breakwater it fell dead calm. As there was a strong ebb tide I dropped my anchor and was glad to see a boat which the same good friend had sent off to tow me in. By three o'clock I was attacking an excellent tiffin in his bungalow which is delightfully situated on the edge of the cliff with a wonderful view, the whole horizon from Cape Ramas to Vengurla being broken only by St. George's Islands.

At dinner I met some very charming members of the small British community at Marmagoa. The meal was served outside almost on the edge of the cliff with the starlit sky overhead and the low growl of the surf below.

Dec. 16.—I visited one or two steamers in the port, and in the evening took the Harbourmaster and his wife for a short sail.

Dec. 17.—To-day was well spent in a trip to Panjim by launch and a visit to Old Goa, though it was very hot and tiring ashore.

A motor car was waiting for me at Donna Paula where we landed, and I was soon slipping through irrigated fields, in which many ploughs drawn by oxen were tilling the soil, towards Panjim, the present capital and seat of Government of Portuguese India. Here we stopped only to order lunch and were soon again spinning along a good road built like a causeway for several miles along the river bank. The river here is broad and surrounded by high green hills; on the top of several of these could be seen large Roman Catholic churches shining white in the bright sunlight. I was informed by the driver that each village has its church and each church certainly appeared to be quite as large as an ordinary cathedral.

Approaching Old Goa the church of Saint Augustine can be seen on the hilltop, an imposing ruin, but little else remains of this once gorgeous city except the cathedral and two or three churches, notably Saint Cajetan, St. Catherine and the Tomb of St. Francis Xavier in the church of Bom Jesus, which have been kept in repair by the Government and in which services are held. Close by are the remains of the Hall of the Inquisition and of several convents, some of whose massive stone columns remain.

In "A Sketch of the City of Goa," published by Thacker & Co. in 1878, Joseph Nicolan de Fonseca states that "In the height of its fame in the 18th century the hills were crowned with elegant structures and lower down might be seen magnificent palaces, convents and churches towering one above another."

Pyrard tells us that it would be an endless task to describe minutely the numerous streets, squares, churches, palaces and other buildings both

public and private which were worth noting in Goa. The number of convents and churches alone was over fifty. The city, excluding its suburbs, is stated by travellers to have been four miles and a half in circumference and the population in the beginning of the 17th century to have been 225,000. By many the city has been described as comparable to Lisbon, at that time, owing to the predominance of the Portuguese navy, the foremost port of the world, and it received the name of Goa Dourada, or Golden Goa.

In describing the social life of the Portuguese at this period Fonseca states that—"They called themselves Fidalgos or Noblemen and never cared to follow any trade or calling," evidently deriving their income from the labour of their slaves, and that—"the females were left at home by their husbands whose jealousy imposed on them such restraints that they were seldom allowed to stir out of their private apartments." Such treatment brought its inevitable consequences, for we read later that—"They passed their time in devising means to elude the vigilance of their husbands. For this purpose they took into their confidence those very servants who had been kept to watch their conduct, and made of them willing instruments for the gratification of their evil propensities." To such an extent did they abandon themselves to these pleasures, that we are told by almost every traveller who visited Goa at this period that they did not scruple to stupefy their husbands with narcotic drugs and admit their paramours into their very bed-chambers.

In fact, with the influx of enormous wealth into the city the morals of the inhabitants became corrupt and depraved and the seeds of premature decay and dissolution could be discerned as the result. Justice and public offices were bought and sold. At this time the Dutch were directing their attention to the East, strengthening their resources and extending their commerce. Goa was unsuccessfully blockaded by them in 1603, but the struggle continued for 59 years at the end of which time most of the Portuguese possessions had fallen into the hands of the enemy and their commerce was crippled.

A serious epidemic, probably of cholera, invaded the city for the second time in 1635 and spread death and desolation within its walls. From this time onwards the grandeur of the city faded and its wealth dissolved and Thevenot, describing his visit in 1666, says—"The city is great and full of beautiful churches and convents and well adorned with palaces. There were few nations in the world so rich as the Portuguese in India before their commerce was ruined by the Dutch, but their vanity is the cause of their ruin." An official document dated December 3, 1687, stated: "The greater part of Goa is abandoned because its inhabitants cannot rebuild their houses when they have fallen."

It was at this time that the Viceroy, the Count of Alvor, decided to abandon the city and transfer the seat of government to Marmagoa where the Palace Hotel still remains as a monument to the commencement of the rebuilding of the city at that site.

This policy was abandoned by Alvor's successor and it was not until 1759 that the Viceroy's palace was moved to Panjim and that port was selected as the capital in 1843.

Now there is no population in Old Goa and the river runs past the ruins of a great city—ruins of churches, palaces, convents, the Hall of the Inquisition surrounded by trees and overgrown by jungle.

Dec. 18.—I left Marmagao at 7.15 a.m. with a light breeze from the NE. The morning was rather cloudy with a white haze over the land and a smoky horizon but the sky is clearing now.

11.30 a.m. : The morning breeze continued light and it has now fallen dead calm.

Later.—At 1.10 p.m. the sea breeze came light from south of west and I lashed a long bamboo as a bowsprit and set the spinnaker as a balloon jib. With all three sails drawing well I made good going and hoped to pass Karli Passage before dark but when within 4 miles of it the wind fell light and I was almost becalmed by 5 o'clock. I therefore set the spinnaker and ran for the bay under the eastern shore of Nuti Point where I now lie with an uncomfortable swell coming in from the south-west.

There is no means of landing so I swam ashore through the surf and stretched my legs along the beach.

Dec. 19.—A nice breeze came from the NE. this morning before dawn, which was unusually brilliant with a sky of flame and more like sunset. I got my anchor at 6.45 and with the breeze aft passed Chaldea Rocks Buoy at 7.15 a.m.

I wanted to see Malvan so, after passing Square Rock, stood due north and was rounding Johnstone Castle Buoy at 8.30 ($9\frac{1}{4}$ miles in $1\frac{1}{4}$ hours). I passed close to the Fort and had a look at the lightship and basket which should be left close to port entering the harbour. The breeze was too tempting to allow me to stay.

Later.—At 11 a.m. the breeze fell light, and at midday it was dead calm. This lasted only about fifteen minutes when the sea breeze came. I was very tempted to continue to Rajapur Bay, but was anxious to see Deogarh, so ran through the entrance and dropped anchor at 2 p.m. in 3 fathoms mud one cable off the custom house on the west shore of the harbour. The entrance to this harbour is narrow, but can be recognized by the light on the cliff of the south side. There are rocks running for about 2 cables SW. from the point north of the entrance which must be avoided when entering the harbour from the north. Then stand on due east toward Saddle Hill, changing course to south round the fort.

Dec. 12.—Later I saw that there is a red lamp at the Custom House—on a standard about 30 ft. above the water. Entering at night, course would be altered to south when this comes into view, and the anchor should be let go when it is abeam.

Inside the bay expands, the creek runs on in an easterly direction and is

navigable to small boats only at high water. There is a large arm extending a mile to the south in which the anchorage lies. The harbour is surrounded by low hills and completely land locked, affording excellent shelter in all winds. It is not particularly pretty as the hills are dotted only here and there with vegetation, being chiefly latyrite rock. The fort is built on the northern triangular extremity of the head south of the entrance. The fortifications on top of the cliffs appear to have been insignificant, but bastions of considerable strength and still intact exist on the rocks of the foreshore.

The third or landward side of the triangle is protected by a moat some 12 feet wide and 10 feet deep cut in the solid rock. The excavated material



Deogarh Fort and Harbour.

from this was no doubt used to build the walls which rise about another ten feet or so behind it, protected on either flank by a circular tower.

The village is a mile further up the bay, but I am told that no supplies are available except soda water. As usual the Customs official here has been most obliging, sending his boat to take me off and securing a loaf of bread and a tin of milk for me from the s.s. "*Kamlavati*," which came in about 3 p.m. northward bound and picked up a large number of mill hands returning to Bombay after the strike.

I am rather sorry I did not just look into the harbour and then push on to Amblogarh. To-morrow I may have another look at Viziadrug or may go on to Paos Bay which, from the chart, appears to be worth putting in at.

To-day's run approx. 36 miles in $7\frac{1}{4}$ hours.

Dec. 20.—I left Deogarh at 5.50 a.m. with the lightest breeze from NE. which remained light and fluky all the morning.

Now at 10.30 my position gives me approximately 12 miles in 4 hours 40 minutes—poor going.

11.45 a.m.: It is now dead calm. A short time ago I saw a whale, but he only showed up once and seems to have disappeared. My tindal was greatly excited and salaamed most obsequiously, whether to propitiate the whale or because, like the conch shell and the cow, it is related to the Great Mother and therefore sacred, I know not.

Later.—At 12.45 the sea breeze came, at first from due north and later NNW., increasing to a good full sail breeze. As I had kept a good offing I was able to make Paos Bay close hauled on the port tack. In the little cove on the north shore there is excellent anchorage in from 2 to 4 fathoms sand, sheltered from all weather during the fine season. I dropped anchor at 4.10 p.m.

The entrance is wide and no difficulty exists in making the bay. The cove cannot be seen until close up to it, and a lamp on the point is lit only when a steamer is coming in. Water, fish and eggs can be obtained from the village at the head of the bay and the customs official was again most helpful in this direction.

Coming into the bay I hooked and landed a very nice raus of about 15 lb., and I have rarely tasted better fish than a steak which I fried for dinner.

There are large numbers of small fish in the bay with larger ones hunting them.

I shall spin round the bay before leaving to-morrow morning.

One spends a much more comfortable and restful night in these little unfrequented bays than in the larger ports, though, except for the scenery, which is frequently all that one could desire, there is little of interest.

(To be continued.)



Editorials.

NUTRITION.

IN the *Bulletin* of the Health Organisation of the League of Nations for April, 1937, there is a very interesting report on the work of the group of experts appointed to study methods of assessing the state of nutrition in infants and adolescents.

In the introduction to this report, Professor Bigwood points out that the first researches on under-nourishment took the form of physiological investigations and group surveys relating to under-nourishment and even complete fasting.

Studies on prolonged fasting were made by Benedict in 1925. In 1919 the Royal Society published Starling's observations dealing with under-nourishment as observed in Germany between 1917 and 1919. These observations referred to an adult dietary which averaged 1,700 calories and consisted of 15 to 20 grammes of protein and from 30 to 40 grammes of fat, and served as examples of acute nutritional deficiency.

The economic depression and the years of unemployment led to grave fears of under-nourishment in the people, especially among the unemployed, and numerous investigations have been carried out here and in other countries. The League of Nations has also issued several reports. Statistics have not revealed any appreciable effect on the aggregate death-rate and valid statistics of morbidity are difficult to obtain.

In some countries the diet of the unemployed was quantitatively deficient; in others the number of calories was sufficient, but the protective foods were insufficient.

At the present time there is a recovery in the general economic situation, and now the main problem of nutritional hygiene consists more in judging the consequences of an ill-balanced diet than the effects of mass under-nourishment. The detection of early and unobtrusive signs of a slight nutritional deficiency has become a burning problem. At a first International Conference held at the end of 1932, the Health Committee of the League sought to bring about an exchange of views on the methods to be employed for this purpose. The conference advocated combined medical and social investigations covering the same groups of the population.

The social side was to include a study of incomes, diet, cost of living, and death and morbidity rates. On the medical side the investigations were to be simple and expeditious methods applicable to mass investigations. The age, sex, weight and height (sitting and standing) were to be recorded, together with an index combining certain of these data—the "Pelidisi" index of von Pirquet. It was thought that a general clinical impression of

the state of health of the persons examined should be given in a simple standard form, and for this purpose the conference recommended von Pirquet's "Sacratama" index. It also recommended that inquiries might be extended in respect of a smaller number of persons by physiological examinations, chief among which were: Determination of the hæmoglobin content of the blood; the protein content of the blood serum, and the ratio of globulin to albumin; fatigability after moderate muscular effort. Signs of preliminary stages of avitaminosis were to be sought for.

Since 1932 a large number of inquiries have been made in various countries and it has been found that the methods advocated were unreliable. Experience showed that from a social standpoint small scale inquiries, carried out with the utmost care, yielded more valuable results than large scale inquiries. Further, medical surveys using rudimentary methods resulted in observations which were difficult to interpret. Simple methods might lead to confusion of purely anthropological considerations, on which the classification of men into different types is based, with physiological considerations, such as differences in physical condition due to defective nutrition. Moreover, it was necessary to distinguish malnutrition of a morbid origin and malnutrition due to defective diet in an otherwise healthy person. Certain fatigability tests were inexpedient in the case of some subjects; and signs which were then regarded as indicating preliminary stages of avitaminosis are now considered evidence of pronounced avitaminosis. In short, knowledge in this sphere has increased considerably since 1932, and a further meeting of experts was necessary to examine these questions.

The experts having been consulted on the methods of assessing the state of nutrition of children and young people decided to recommend three types of inquiries applicable to different requirements.

The first type of inquiry is a rough classification for a large number of subjects (mass inquiries). The experts recommended the preparation of record cards giving particulars of: (1) Age; (2) sex; (3) physical appearance; (4) weight; (5) height (and possibly sitting height). In addition each child was to be subjected to an elementary clinical examination. The object being to discriminate between children who seem to be normal and those whose nutrition appears to be defective; these children should have a special medical examination and inquiry be made as to their food.

The second type is more thorough and covers less numerous groups. This includes: (a) inquiry into the child's food intake; (b) inquiry into the economic and social status of the child's family; (c) thorough medical examination. The following tests are also suggested: (d) the bisacromial breadth, breadth of pelvis, chest girth, etc.; (e) measurement of hæmoglobin and protein content of blood; (f) photography. Also tests for unapparent vitamin pre-deficiency.

The object of the third type of inquiry is to study scientifically the disturbances to which all the functions of the body are subjected when the

diet is quantitatively or qualitatively deficient. The inquiries included the tests of Type 1 with as many significant measurements as possible of all morphological characteristics and biological functions amenable to mensuration. The inquiry should include measurements bearing on the muscular system, the digestive system, the nervous system, the endocrine system, and the urinary system as well as blood-tests and sensorial measurements and psychological tests. Furthermore, each subject should be submitted to a complete medical and psychiatric examination.

For inquiries of Types 2 and 3 information regarding food intake was considered indispensable.

No matter how elaborate the inquiry might be, information as to the child's progress in school work should be added.

It will be seen that the tests recommended by the experts are divided into three categories, somatometric, clinical and physiological. The term somatometric is considered preferable to biometric, which is more commonly used but may refer to functional measurements.

Professor Bigwood has reviewed the present state of our knowledge concerning the tests.

The relation of height to weight forms the basis of the somatometric tests and he states that measurements of height and weight may serve for easy detection of exceptional cases of pronounced malnutrition but cannot give any indication as to whether this condition is due to organic or to dietary causes. It is a very rough method, as a scale of weights and heights established on the basis of statistical measurements is unreliable. Anthropological differences are sufficiently marked to preclude the choice of a single scale of comparison. Statistical averages show differences not only between countries, but between different parts of the same country, even between different races in one and the same district. This has been shown by extensive somatometric investigations carried out in England by the Board of Education and the Ministry of Health. Material differences were observed between the mean height and weight of children of the same age according to the locality. These discrepancies may be due to social circumstances or to feeding habits, but they may also be attributed to other causes. In the Netherlands height and weight measurements at different ages in non-Jewish schools and in Jewish schools showed a consistently greater height and weight in non-Jewish schools. The divergencies are attributable to differences in race and possibly, but only in part, to differences in dietary habits.

The growth of children of well-to-do parents is in advance of that of children of the poorer classes. This conclusion emerges from observations made in Oslo and in Vienna under the auspices of the American Save the Children Fund.

In England Sir John Orr found that the mean height and weight of children of the same age differed according to social class.

Professor Bigwood concludes that a study of the trend of the mean

weight and height of children and adults in the same social group from year to year, or a comparison between such values obtained in the same period in different social groups, can provide interesting data on the state of nutrition.

This conclusion is considered to justify the proposal which has been made by the experts to repeat these measurements at given intervals.

A series of more complicated somatometric indices has been tested by health experts. Quetelet's Index $\frac{\text{weight}}{\text{height}^3}$, and Livi's Index $\frac{100 \times \sqrt[3]{W}}{H}$ are not much used now.

Röhrer's Index $\frac{W \times 100}{H^3}$ has been much used in Germany since the War, but has now been abandoned by the majority of experts. Schiötz thinks it may be of value when used at regular intervals with the same child, but that it gives no indication of the child's state of nutrition.

Manouvrier's Index $\frac{H - SH}{SH}$. SH indicates the distance from the vertex to the seat when the person is sitting. In German-speaking countries this ratio is known as "length of leg to sitting height ratio." These measurements are characteristic of constitutional types. They may reflect a pathological condition involving disturbances of nutrition.

Von Pirquet's "Pelidisi" Index is $\frac{\sqrt[3]{10 W}}{SH}$. W = weight in grammes and SH = sitting height in centimetres. As already mentioned this index has been recommended by the experts. Pirquet considered that it expressed the state of nutrition of the subject examined, owing to the relation between the terms of the "Pelidisi" ratio and the absorption area of the intestine. This relation is based upon two statistical findings: (1) The length of the intestine is about $\frac{1}{10}$ the height. (2) The cube of the sitting height in centimetres is about ten times the body-weight in grammes. From various calculations is deduced the following ratio which gives the Pelidisi Index $\frac{\sqrt[3]{10 W}}{SH} = 1 = \frac{100}{100}$. The theoretical normal index is thus represented by unity, but in reality the measurements yield a figure which deviates somewhat from this. According to Nobel the real figures are as follows: School children whose index varies from 95 to 100 are normal. And those below 95 are under-nourished, while those whose index exceeds 100 are over-nourished. In adolescent youths the limit of malnutrition corresponds to an index of 98 and in adolescent girls to an index of 99. This complicated index has not given the results which were expected of it, and most hygienists are of opinion that it is preferable not to use it.

Somatometric tests alone being inadequate as a means of forming a sound opinion concerning the state of nutrition of an individual or group of individuals, it has been recommended that mass investigations should be supplemented by simple clinical examinations. The Board of Education and the Ministry of Health classified children in four groups—excellent,

normal, slightly under-nourished, bad. The groups—good, doubtful, bad—are considered preferable. In addition Schiötz suggested three physical types : Tall or slender, medium, short or stocky.

The chief drawback to very simple classifications is that there are no precise or objective standards of reference. This classification is founded on ill-defined considerations and they are not comparable *inter se*. In order to remedy these defects the experts recommended von Pirquet's *Sacratama Index*. The purpose of the index is to assess the blood content of the skin, the condition of the subcutaneous fat layer, the elasticity of the skin, and the condition of the muscles. This index has been little used except in Vienna, and does not seem to have been as practical as was hoped.

A rapid examination of the nose, ear and throat and an examination of the teeth are recommended as supplementary clinical examinations. The condition of the teeth is an excellent indication of satisfactory or unsatisfactory nutrition.

A sign specially recommended by Schiötz in mass investigations, constituting a true test of the state of nutrition, is the appearance of the median furrow of the back when the arms are held straight above the head. If the median furrow is broken or unduly sinuous, it is considered to be an indication of defective nutrition ; the first sign is the more important. At Oslo the sign has been found a simple and accurate test. It appears to depend really on the normal development of the spine and thorax under the influence of a properly balanced diet.

Physiological tests of defective nutrition, according to Professor Bigwood, have varied most. He distinguishes two groups : (1) Specific physiological tests for malnutrition, and (2) non-specific physiological tests consisting of functional tests that may be indirectly affected by defective nutrition.

Among the specific physiological tests, the most important is the early diagnosis of latent pre-deficiency of vitamins A, D and C.

Vitamin A deficiency test in human pathology is concerned with the part played by this vitamin in the production of visual purple. The rapidity with which this pigment is bleached under the influence of light and regenerated in the dark seems to depend on the concentration of vitamin A in the retina. The tests which are applied are based on determination of the rapidity with which the eye adapts itself to a change in the conditions of light in which visual acuity is measured. Edmund's method and Birch-Hirschfeld's photometer method have been suggested for this purpose. Jeans and Zentmire working with Birch-Hirschfeld apparatus in America consider that this test can be relied upon to indicate vitamin A pre-deficiency in 95 per cent of cases.

A latent pre-rachitic state can, according to certain authorities, be detected by measuring the phosphatase content of the blood serum. The percentage of this enzyme increases in the presence of various bone, and

even of other, diseases. The increase is therefore not specific for rickets. But if it can be shown to occur regularly in children suffering from incipient rickets but otherwise normal, it may be of some practical importance as an indication of vitamin D pre-deficiency. Vermehren's observations, though still of a preliminary character, show that the test promises to yield satisfactory results.

A latent pre-scorbutic condition is indicated by fragility of the small blood-vessels. Normally they can be considerably distended without rupturing, but in a scorbutic syndrome they break under slight pressure and punctate perivascular extravasations result.

When vitamin C deficiency is not very marked, moderate distension is necessary before the fragility is apparent. To detect this Hecht employed suction with a small cupping glass connected to a pressure gauge. When the resistance of the vessels is normal they can stand suction for thirty seconds at a barometric pressure of 175 to 350 millimetres without the production of petechiæ. The method is accurate, but it would appear that in certain cases the condition is due to a morbid cause not necessarily produced by diet.

Determination of vitamin C content of the blood has been suggested, but the methods of determining the vitamin content do not eliminate certain sources of error.

When the diet is deficient in protective foodstuffs, especially when there is a shortage of milk and cheese, there is deficiency of calcium and phosphorous. Conditions of vitamin pre-deficiency have a marked effect on calcium assimilation and the acid-base balance of the diet also has an influence. Our knowledge of the signs of mineral deficiency are still very imperfect.

In determining iron deficiency the Davis hæmoglobinometer is recommended, the blood being taken from the lobe of the ear. Mackay and Davidson report that half the women who come to hospital are suffering from anæmia, which may have its origin in defective diet. Studies are being carried out with a view to the statistical comparison of the nutrition in groups differing from one another in respect of the mean hæmoglobin content of the blood.

While the specific physiological tests are designed to reveal latent states of pre-deficiency attributed to an ill-balanced diet deficient in protective foodstuffs, the non-specific tests are concerned with physiological functions liable to be affected by under-nutrition. These tests apply to all physiological measurements of the muscular, respiratory, circulatory, digestive, nervous and urinary systems. Many tests have been suggested, but only a few can be mentioned, such as:—

Measurement of the basal metabolism, which tends to slacken in persons who have long suffered from under-nutrition. It remains to be determined whether this can be used to detect under-nutrition at an early stage. It appears unlikely to do so: a fall in basal metabolism is an index of protein

deficiency rather than a shortage of total calories, and the lack of protein must be serious before it affects basal metabolism.

A fall in the sugar content of the blood: The sugar content does not appear to be appreciably affected when the diet is unsatisfactory, as there is never any shortage of carbohydrates in an ill-balanced diet.

The determination of the total nitrogen content of the urine, of creatinuria and the urea ratio has been suggested. But they will not reveal a lack of balance in a diet of adequate energy value.

Professor Bigwood considers that if we are to improve our knowledge of the state of nutrition of populations, inquiries in future must be directed towards obtaining further evidence as to the significance of the tests themselves—the acquisition of more accurate knowledge as to their value—and thereafter the collection of accurate data as to the requirements of the body in respect of protective foods and the variability of such needs in relation to climatic conditions.

FIRST INTERNATIONAL TECHNICAL CONFERENCE ON AERIAL RELIEF WITH DEMONSTRATIONS AND COMPETITIONS.

At the First International Technical Conference on Aerial relief held at Budapest between June 11 and 14, 1937, a number of papers were read and addresses given.

These dealt with every aspect of medical aid rendered by aeroplanes, either in the transportation of sick and wounded and their medical attention during the journey or the supply to isolated persons of food, water, medical stores or of a doctor.

Of special interest to the Army were the contributions by the British, French and Italian members.

Colonel E. M. Cowell, D.S.O., County Director, British Red Cross Society (Surrey), read a paper on "Air Medical Transport in Great Britain."

He pointed out that although special air ambulance machines exist, most of the transport is done by converting ordinary civil machines for the occasion. To act as escort personnel, special Red Cross nurses have been recruited and trained to carry out their nursing duties in the air.

He stated that exercises in Air Medical Transport had been carried out during the 1934, 1935 and 1936 Army manœuvres.

It was found that casualties could be loaded at the forward landing area and conveyed twenty miles to the casualty clearing station in ten minutes. By road this would have meant several hours driving on a road congested with military transport. The machine made three double journeys in a little over an hour.

Surgeon-General Schickele (France), in his paper on "The Transformation of Private and Commercial Aeroplanes for Air Ambulance Purposes," considers that any commercial and private aeroplane intended for the transport of human beings is capable of serving as an air ambulance aeroplane.

Certain indispensable qualities of security and comfort must, however, be demanded when sick or wounded are being transported. These have special reference to risks of starting, flying, reduction of shock on landing and means to fly automatically when visibility is poor. For comfort the essentials are smooth running on the ground, the cabin must be large, well closed and warmly ventilated and the sound of the engine deadened as much as possible.

The introduction and removal of stretchers from the cabin should be easily accomplished.

The latter requirement rules out the carriage of lying cases in practically every plane that has not been constructed with this object in view. The special contrivance on which the stretcher is placed must be equipped with straps with which to secure the patient.

Means of communication between patient and pilot is important where there is no attendant, but General Schickele considers that in all cases of severe illness or wounds an attendant is essential.

With regard to equipment and supplies, a medical box with splints and drugs, an oxygen apparatus and a supply of water are recommended, while a trap door through which refuse can be evacuated should be conveniently placed in the floor.

In dealing with the subject of revictualling from the air, Colonel Armando Ferroni (Italy), described the method used by Italy in Libya and during the Italo-Ethiopian conflict for the supply of water and food by air.

The containers used for the purpose were of two kinds : canvas bags and metal cylinders, both fitted with parachutes. The bag was of stout canvas with a zipp fastener opening at the side. The largest bag had a capacity of seventy kilograms. There were three types of spindled-shaped containers used, one for solid food, one for liquids only and the third for medical and surgical supplies.

During four months of the Ethiopian campaign in 1936, some 1,400 tons of supplies were delivered by aeroplane.



Clinical and other Notes.

THE "HORAN BROWN" MODIFICATION OF THOMAS'S SPLINT.

BY MAJOR-GENERAL D. S. SKELTON, C.B., D.S.O.

IN the past, the usefulness of Thomas's splint has been minimized from the Army point of view, particularly, by several factors, not the least of which are the problems of carriage and of storage. We all of us are

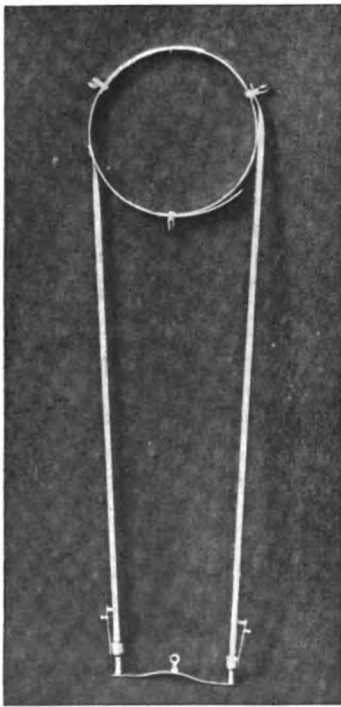


FIG. 1.—The hinged, telescopic adjustable Thomas's splint for leg or arm; flat for packing.

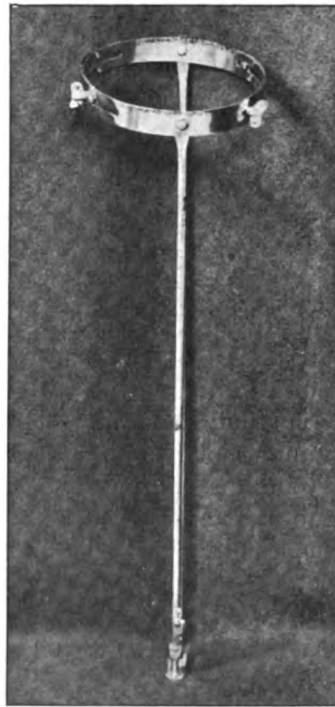


FIG. 2.—The same opened out.

familiar with the unsightly, dust-collecting heap of Thomas's splints on top of an "almirah" or other cupboard—much too small to hold them. Another disadvantage lies in the fact, that a range of splints must be stocked to meet the varying sizes required. Mr. A. G. Ord, F.R.C.S., of the Royal Hospital, Portsmouth, overcame this disadvantage in his adjustable Thomas's leg and arm splint, in which the ring is expandable. This, when fully open, will fit the largest thigh and when closed can as readily

be used as an arm splint. The side members in the Ord modification are steel tubes with telescoping rods, so that the splint can be lengthened as required. The Ord splint weighs 3 pounds and when collapsed measures 23 inches in length with a $6\frac{1}{2}$ inch ring.

Having regard to these advantages the Medical Directorate, A.H.Q., India, on the look-out for a more portable splint for frontier warfare than the standard Thomas's, got into touch with the makers of the lighter and shorter article with a view to trying it out.

It was then found that Lieutenant-Colonel H. Horan Brown, M.B., I.M.S., had devised a modification of Ord's splint, which seems to overcome most of our difficulties.

Horan Brown has hinged the adjustable ring. On the outer surface he has fitted a wing-nut which firmly secures or releases the hinge. The ring can be adjusted to any useful circumference and, further, can now be hinged to any comfortable shape to fit leg or arm. And, when folded flat, the splint can be packed absolutely flat.

This device then means that we are no longer compelled to tie our Thomas's splints on to a mule, camel or roof of an ambulance car as best we can, but can pack a dozen or more in a fracture box.

With Lieutenant-Colonel Brown's permission, I have taken some photographs of his modified design, and the usefulness of the apparatus is at once apparent.

I think this design solves all our transport difficulties, and will prove of the greatest value on account of economy in load and space if adopted for field medical units.

And not only has this folding, adaptable Thomas's a use for field medical units, but every V.A.D. and ambulance unit will doubtless be glad to have one for training purposes. Then inspecting officers on the occasion of the annual visit need no longer be moved to mirth by the sight of five inches of leg of a small boy "fixed" in a ring about eighteen inches in diameter.

IMPROVISED APPLIANCE FOR USE WITH STEINMAN PIN APPARATUS.

BY CAPTAIN D. R. NICOL,
Indian Medical Service.

THE following suggestion is submitted as the result of experience in the treatment of fractures at the Combined Indian Military Hospital, Bannu, during the Khaisora operations, 1936-37.

During the first few days of the operations in November and early December, 1936, a number of gunshot wounds of the legs were admitted with fractures of the femur or tibia and fibula. These were treated either by Kirschner wire and calipers with Balkan beam or by Steinman pin and calipers.

Unfortunately the supply of Kirschner wire appliances and Steinman pin calipers at the time was inadequate to treat all the cases. To obviate the delay in treatment which would have resulted, the writer suggested the following improvisation to the surgical specialists of the Rawalpindi and Waziristan districts, and with their approval it was carried out.

An ordinary cavalry spur, which has studs for the straps, was used in place of the standard calipers. The studs were knocked out of the spur by a centre punch and the spur was then sterilized. The pin was driven through the bone in the required position, and the spur, sprung open by the operator, was clipped in place. The stud holes were clipped on the pin and adhesive tape was fastened around the spur shank and over the protruding ends of the pin. The patient was then set up in the usual Thomas splint and a rope was attached to the spur and passed through a pulley on the Balkan beam. Weights were attached to the rope and the desired traction was obtained. The spur remained in position until the patient's convalescence and was found to work as well as the more elaborate calipers specially designed for the purpose. This emergency method appears to have the following points to its advantage:—

(1) A spur is easily obtainable from any mounted unit, and only a few minutes are required to prepare it for use. Should the holes be too small for the pin, they can be quickly enlarged by a drill to the required size.

(2) Pins can be made quickly in any repair shop possessing tool steel.

(3) The spur is easily sterilized and requires no adjusting. It can be sprung sufficiently to slip on the pin by anyone with ordinary strength.

(4) An unlimited number of cases can thus be rapidly treated, and delay, due to lack of sufficient conventional apparatus, is eliminated.

Echoes of the Past.

WAR EXPERIENCES OF A TERRITORIAL MEDICAL OFFICER.

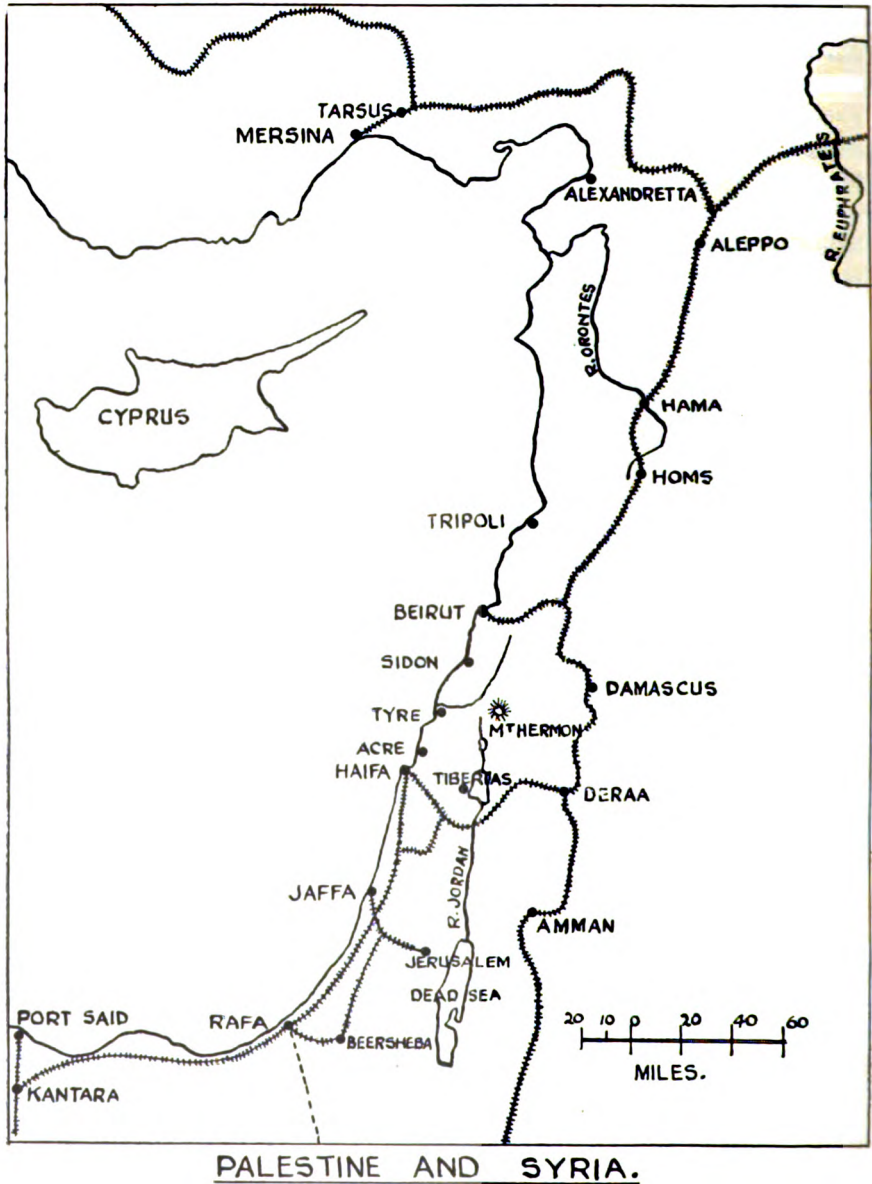
BY MAJOR-GENERAL SIR RICHARD LUCE, K.C.M.G., C.B., M.B., F.R.C.S.

(Continued from page 277).

CHAPTER XXIX.—TOUR OF INSPECTION TO BEIRUT AND DAMASCUS.

After two days at G.H.Q. to deal with the arrears of office work, the D.A.G., Major-General Western, and I, started off to make a tour of the forward area. We took two touring cars and a good supply of provisions. The first day brought us to Haifa. On the road we visited the various field ambulance posts which we passed. A considerable number of the sick was still coming down from Haifa by road, as the two hospital ships available could not cope with the admissions to the hospitals there. A chain of

feeding and resting posts had therefore been established between Haifa and Ludd to accommodate the convoys. The broad-gauge railway was being steadily pushed on towards Haifa. As far as Tul Keram it followed the



Turkish narrow-gauge line and then struck off towards the coast, along which it would make its way to Haifa, while the Turkish line turned eastwards into the hills so as to pass near Nablus. At this time the new line

had reached a point a few miles North of Tul Keram, and large gangs of Egyptians were being employed on its construction. The motor road was only a mud track and in places very rough and sandy. For the last twenty miles it runs along the coast between the sea and the range of hills which culminates in Mount Carmel and forms the hook on the Palestine coast so well known to us when it was our Sunday task at school to construct maps of Palestine showing the distribution of the twelve tribes.

The slopes of Mount Carmel are steep, and the foreshore on the west side is only a few hundred yards wide and in some places swampy and malarious. As one rounds the point the fine broad bay of Acre opens to view with the town of Haifa spread out along the north face of the Mount.

Ten miles across the bay to the north can just be discerned the old fortress town of Acre. The ascent of the Mount from the town is made by a zigzag motor road. From the plateau at the top a magnificent view is obtained in all directions. The high promontory is a striking geographical feature and must have formed a splendid setting to the dramatic episode enacted there nearly twenty centuries ago. As one stood there one almost seemed to hear the great chorus of priests crying to Baal, and as one looked out westwards one could not help trying to trace the shape of a hand in the fleecy clouds on the horizon.

Towards the north the view of Acre brings other historical memories. The association of that town with King Richard and the Third Crusade; the gallant and successful defence of the town a hundred and twenty years ago by Sir Philip Sidney against the full strength of Napoleon, which broke the spell of his triumphant Egyptian and Palestine campaign and robbed him of those Alexander-like dreams of world empire which had got possession of him.

On a prominence of the hill the Turks had mounted a big naval gun to protect the bay, which could also, if required, be turned landwards. Close beside it stood, till shortly before our visit, the monument erected to commemorate the landing of the Kaiser at Haifa in 1908, on the occasion of his great pilgrimage, but it had been thrown down from its pedestal a few days earlier by sacrilegious hands, as William himself was so soon to be from his.

We reached Haifa at 3.15 and put up at a small German hotel near the Quay. That afternoon we inspected the 2nd East Anglian Field Ambulance Hospital in a Franciscan monastery near the point, and the 33rd Casualty Clearing Hospital which had opened in a big Jewish college on the slopes of the hill behind the town. The arrangements there were exceedingly good, and though it was very full everything was working well.

Night came upon us before we had finished, and the visit to the Prisoners of War Hospital had to be deferred till the next morning. We found things somewhat improved since our previous visit. As we had

ninety miles to cover we made an early start for Beirut, hoping to get through most of the work there during the afternoon.

The road passes out through the old town at the head of the bay, and then it is customary for motor cars to leave the road, which runs inland, and strike off along the beach. The River Kishon runs into the sea near the head of the bay just outside the town. Though a fair-sized stream inland, at its mouth it spreads out over a sand bar so that it can be forded in a motor car. The beach is sandy for the whole ten miles to Acre. Motor cars run well on the hard wet sand just above the water's edge. If you diverge into the dry sand you plough in hopelessly, whereas on the other hand if you stop as we did for a moment too close to the sea the wheels sink into the soft wet sand and become more deeply buried as each wave breaks over them. In a few minutes our car was down to its axles, and had there not been a company of the 54th Division marching by to bodily lift it out of the quicksand the car would inevitably have been lost. As long as the car was kept moving on the hard sand the going was splendid, and it did not take long to cover the ten miles to Acre.

We passed through Acre without time to explore it. It is still a walled town with its old-fashioned fortifications largely intact. The town itself is a network of narrow streets lined with rather squalid houses.

A few miles north of Acre the road has to cross a high ridge of hills which comes down to the coast and ends in a cliff overhanging the sea. The road across it, known as the Ladder of Tyre, had got into very bad repair and in places had broken away altogether into the sea. A new road was in process of being made as we crossed. A magnificent battalion of Sikh Pioneers was engaged on this work.

Tyre itself is on a promontory standing out into the sea, so that the road passes inland about a mile from it. Sidon, now known as Saida, lies on the road several miles further on. This is a more pretentious town. Here we inspected a small field ambulance hospital belonging to the 54th Division. They were sending their cases on to Beirut for evacuation.

Beirut is a big, densely populated town. It has the only good harbour on the Syrian and Palestine coast and in peace time was a flourishing port. During the War it had suffered badly. Blockaded from the sea, its industries and means of subsistence were largely gone. Being off the Turkish lines of communication and with its railway out of repair, it had played but a small part and the Turks had done little for it. The streets had got into a very bad state. At the time of our occupation the poorer people were almost starving. During the first few days it was no uncommon event to find the emaciated body of a starved child lying dead in the streets.

After finding quarters at a hotel near the quay we paid a visit to Lieutenant-General Bulfin at the headquarters of the 21st Corps. It was evident that he and his D.D.M.S., Colonel Sewell, were considerably worried about the medical conditions in Beirut. The sick-rate was high

and the hospitals were overcrowded. The two hospital ships available, even when kept running continually between Beirut and Egypt, could not get the cases away fast enough to keep down the pressure.

The 32nd Casualty Clearing Hospital had opened in the Turkish hospital building, and there was another hospital in the Jesuit College staffed by a field ambulance which would be taken over by No. 15 Casualty Clearing Hospital as soon as it arrived.

At this time practically all the sick from the troops stationed North of the Sea of Galilee were being sent to Beirut for evacuation.

The 7th Indian Division had already pushed on north towards Tripoli, but were sending their sick back to Damascus, as the 74th Casualty Clearing Station destined for Tripoli had not arrived.

The 54th Division was gradually arriving from Haifa to take the place of the 7th Division.

Beirut was also the only practical route of evacuation from Damascus and from the Mounted Division pushing on northwards along the line through Homs and Hama towards Aleppo.

As soon as the casualty clearing station could be opened at Tripoli the sick would be taken there by motor ambulances from Homs.

For the moment the congestion at Beirut was very serious. After our visit to Headquarters we inspected the hospital in the Jesuit College which was in a satisfactory condition except for some sanitary defects. They had five hundred patients. Having been overtaken by darkness we continued our inspection at an early hour the next morning.

The casualty clearing hospital in the Turkish hospital had over seven hundred patients. It was terribly overcrowded and showed distinct signs that the staff were unable to cope with the double work of looking after the sick and keeping the place in order. We did our best to arrange further assistance for them, but it was obvious that the greatest need was more rapid evacuation and the speedy opening of the second casualty clearing station.

I wired back to G.H.Q. to expedite the provision of a third hospital ship and to have some very necessary sanitary appliances sent up at once. It was also arranged that we should instruct Damascus not to send convoys of sick to Beirut without consulting with the D.D.M.S. 21st Corps.

The authorities of the American University College at Beirut had placed at our disposal a most excellent building for use as an officers' hospital and had been most kind in helping to look after the patients. We visited this hospital before we left and found the officer patients in very comfortable surroundings.

We got away from Beirut soon after 9 a.m. on the 24th for our journey over the Lebanon mountains. Four miles out we stopped to visit a field ambulance hospital in a lunatic asylum, splendidly situated on the lower slopes of the mountain.

After leaving here we began the long winding climb. It was a lovely

morning and the views as we mounted were entrancing. The mountains are well wooded and dotted over in all directions with picturesque white villages. Of the famous cedar trees we saw none, though there are, I believe, one or two kept as a special show for tourists. Soon after we passed the summit it clouded over and during our descent on the other side we came in for some very heavy storms of rain and sleet. As we got down into the valley it rapidly became warmer and a soft drizzle set in.

At Moallaka, the first village we came to in the plain, we found a small field ambulance hospital in the station buildings. This station is the point where the railway from Damascus to Beirut begins to be cogged and where the special engines for the mountain journey are hooked on. All these engines had long been out of repair and it had been impossible to work this part of the line. Sitting patients from Damascus were brought by rail as far as Moallaka, admitted to the hospital there for rest and food, and then sent over the mountains by motor ambulance to Beirut. Owing to the poor condition of the rolling stock and the fact that no coaches could be spared for conversion into proper ambulance carriages, more serious cases had to be sent from Damascus by road. These too, broke their journey at Moallaka. After visiting the hospital we went on our way to Baal Bak to pay a visit to General Barrow, commanding the 4th Cavalry Division, and to see the world-famous ruins there.

Baal Bak is in the middle of the open plain which lies between the Lebanon and the Anti-Lebanon mountains. It is twenty miles up the broad-gauge Turkish railway which comes from Aleppo and the north and joins up with the narrow-gauge Damascus—Beirut line at Ryack. There is no doubt about the glories of the ruins. There are the remains of three magnificent temples grouped together in one enclosure. They were dedicated respectively to Jupiter, Venus and Bacchus. They are in sufficient repair to give a good idea of their architecture and decoration. The origin of these temples is wrapped in obscurity, but it is thought that they date from the early years of the first century A.D.

After our visit we drove back to Moallaka and spent the night there. General Western stayed with a well-known and wealthy Syrian landowner who lived there. His A.D.C. and I found very comfortable quarters in the house of a gardener, Jussef by name. We slept on rugs on a raised part of the parlour floor and were provided with milk and home-made bread next morning.

In the evening in pouring rain I went to see my old friends the London Mounted Brigade Field Ambulance, who had gone with their brigade to Salonika on the breaking up of the 2nd Mounted Division in 1916 and on their return to Egypt had become attached to the 4th Cavalry Division. They had a hospital for their division in a building near the main road to Damascus.

Early next morning we resumed our journey to Damascus. The road after crossing the plain has to make its way over the Ante-Lebanon

mountains. These run parallel with the true Lebanon and end some miles south in the hoary old head of Mount Hermon, which with its snow-capped top stands like a watch-dog looking out over the whole of Palestine to the south.

The country is wild and desolate. The whole route was strewn with debris of the Turkish Army, for this had been their main route of retreat from Damascus. Vehicles and dead animals were scattered everywhere along the roadside and here and there a dead Turk had so far escaped burial.

We reached Damascus at eleven-thirty. The last part of the road runs down a lovely valley by the side of a mill stream which is one of the tributaries of the Abana River. No really good panorama of the city is obtained by this approach, as a turn in the valley close to the town shuts it off from view. The city covers a big area on the plain which shelves off towards the East into the desert. It has a population of over five hundred thousand and is probably the oldest city in the world. The modern part is built on the slopes of the hill to the westward and overlooks the old town.

We had no time for sightseeing. The medical position in Damascus was as serious as that in Beirut and we had but a few hours to gain a first-hand knowledge of it. We obtained quarters in the Victoria Hotel opposite the station.

The government of the town was in the hands of the Emir Feisal and the Arab army which had co-operated with us in the capture of the city. During the advance the Arab army had marched up parallel with our own along the Hedjaz railway and arrived simultaneously.

The streets at Damascus were still full of Arab troops dressed in khaki uniform with Arab head-dresses. They rode about the town on rather sorry-looking nags, each man armed with a couple of rifles, one slung across his shoulders and the other loose in his right hand, evidently bent on showing themselves off and filled with the joy of victory. There was a good deal of indiscriminate firing during the first few days of the occupation mostly, I believe, what might be described as a *feu de joie*, the bullets going casually into the air and not in the express direction of passers by.

Our first visit was to General Chauvel, who had his headquarters in a fine villa in the new part of the town. There we also found his D.D.M.S., Colonel Downes, who was also the senior medical officer of the Australian Force attached to the Egyptian Expeditionary Force.

They had quite as many difficulties to put before us here as General Bulfin had had at Beirut. Medical administration had been and still was very difficult. There was a high sick rate, largely due to influenza, but partly also to malaria contracted in the march north. It had been quite impossible up to this time to get a casualty clearing station to Damascus, though Lieutenant-Colonel Cahill, commanding the 66th Casualty Clearing Station from Jerusalem, had just arrived to make arrangements for the location of his unit which was on its way up.

To avoid friction with the Arabs and also for sanitary reasons the British troops were for the most part quartered outside the town, whereas the three hospitals used for British troops were in the town, two of them right in the densest part of the old town and almost inaccessible for motor cars. These hospitals had in pre-war times been respectively British and French hospitals. The third, which had been the German hospital, was close to the station in a better neighbourhood and much more accessible. There was another field ambulance hospital two miles to the south of the town.

All were still overcrowded and understaffed, though the pressure was evidently not so great as it had been a week or so earlier. The only medical personnel and equipment available were those of the small and very mobile cavalry field ambulances. Little or no equipment could be obtained locally. The health of the troops was improving. There had been some formal complaints sent by zealous Yeomanry officers as to the medical treatment that they and their men had received in the Damascus hospitals. These complaints had to be investigated. Most of them were not really very serious and all the points complained of were fairly excusable under the very difficult circumstances of the time. Many medical officers had gone sick and there was no possibility of their being immediately replaced. Added to this, there had at first been great difficulty in obtaining an adequate supply of medical comforts though the supply department had done their best to collect what could be obtained locally. The supply difficulty was over before our arrival and the overcrowding and shortage of personnel would be lessened when the 66th Casualty Clearing Station reached Damascus.

It was evident that it would be some time before evacuation of sick from Damascus could be arranged on a better footing. The congestion at Beirut and the impossibility of using the Damascus—Haifa railway until the broken bridges were repaired stood in the way. It was necessary, therefore, to concentrate on providing better accommodation for our sick in Damascus itself, and on trying to improve the health of the troops by camping them on a good healthy site well away from the town. Such a site existed about three miles to the south where the soil was sandy, there was no standing water and no mosquitoes. It was agreed that the troops should be concentrated there in camps. At the same time it was decided to open the casualty clearing station close to the camps. The two hospitals in the town were to be closed as soon as they could be cleared. The German hospital near the station would be retained as it was a good building and easy of access.

The next problem that confronted us was the disposal of prisoners of war. The bulk of them had been congregated in a camp at Kaukab, fifteen miles south of Damascus, on the road to Tiberias. At one time there had been 15,000 there, but this number had been reduced by this time to about 6,000. Besides these there still remained a good many in Damascus employed on various fatigue and conservancy works.

The large Turkish hospital in the barracks close to the railway station still contained about 1,500 and there was no possibility of getting them away south for the moment, even if we had anywhere to send them. The numbers had been reduced somewhat by deaths and recoveries but fresh admissions were constantly taking place as the prisoners were nearly all in a poor state of health. It was obvious, therefore, that we should have to keep this hospital open for the time being and make the best of it. There were plenty of Turkish and Syrian medical officers to treat the patients, but they were quite useless for administrative work, so it was decided to send up a senior R.A.M.C. officer to take command.

Among the patients were a good many cases of typhus. It was arranged to isolate them in a separate adjoining building, and a campaign against lice and other vermin was organized. We also interviewed the railway authorities with a view to obtaining a better service and improved accommodation for patients on the railway between Damascus and Moallaka. After a long conference with Colonel Downes and Lieutenant Angus, my Sanitary A.D.M.S. who was in Damascus at the time, I embodied the results of our inspection and the policy we had formulated in a report which was sent to General Chauvel.

At Damascus I met Captain Ramsey, an R.A.M.C. officer who had been detailed to serve as medical officer with Colonel Lawrence, and the other British officers who accompanied the Emir Feisal and the Arab Army during its march north. He gave a most interesting account of his experiences and was full of admiration for the Emir who was always ready to listen to recommendations on the medical problems of the campaign, though not always able to carry them out.

We left Damascus at 7.30 next morning, October 26, calling on our way at the proposed camp site three miles out where an Australian field ambulance was occupying the building which was to form the nucleus of the casualty clearing station when it arrived.

We then went on to Kaukab to inspect the prisoners of war camp and its hospital. The health of the prisoners was improving, but there were still about three hundred in hospital. In the whole camp there remained 6,000 Turks, the rest having been despatched south by route march in batches of 1,000 at a time.

On leaving Kaukab the road passes over a desolate and stony plain skirting the eastern side of Mount Hermon which stands up grandly from the plateau. The mountain still showed patches of snow near its summit, though no fresh snow had yet fallen. The stones which cover the plain are a kind of pumice, evidently volcanic in origin. The Turks had recently been at work on this road and there were several derelict steam rollers by the wayside.

After passing Mount Hermon which forms the southern end of the ante-Lebanon range, the road leads westwards and begins to drop rapidly into the upper end of the Jordan Valley. It crosses the Jordan between Lake

Merom and the head of the Sea of Galilee, and then makes its way on to the high ground to the west of the northern end of the lake. About ten miles from Tiberias it descends again to the shores of the lake of which a magnificent view is obtained as one descends. Tiberias is now the only town on the lake. Conditions must have been very different in Galilee in New Testament times. The population must have been bigger and more flourishing. Few of the numerous villages which then fringed the lake have left any remains and the fishing industry is no longer a flourishing one.

Tiberias itself contains many remains of ancient days, walled fortifications and other buildings. Picturesque and romantic as it is in appearance, it is full of the direst potentialities for evil. Here it was there occurred only a few weeks before that outbreak of cholera already referred to which added so greatly to our anxieties.

At the time of our visit there were only a few convalescents left in the hospital. No fresh ones had occurred for over a fortnight. We met at the hotel in which we stayed the members of the American Zionist Red Cross Mission who had done such excellent work. With them we inspected the cholera hospital.

Next morning, October 27, we started very early on a flying visit to Samakh, a small village near the foot of the lake. This was an important point on our line of communication, for here the railway, having crossed the Jordan, a few miles lower down, turns eastward up the valley of the River Yarmuk to meet the Hedjaz railway at Deraa. About five miles east of Samakh, where the railway crosses the valley by a high viaduct, the Turks had done much damage by destroying the arches, and the work of repairing them was causing serious delay in the re-establishment of the railway service to Damascus. The construction of temporary wooden bridges had been entrusted to a Canadian Bridging Company. Samakh and the valley of the Yarmuk in which the work was going on was a hotbed of malaria and the Canadian company and the troops engaged in guarding the temporary railhead were suffering seriously from its ravages, almost to the extent of stopping the work at times. It was a work that must go on, but we did our best to get as many as possible of the supernumeraries removed to more healthy camping sites.

To proceed on our journey we had to retrace our steps to Tiberias and then skirt westwards over the hills to Nazareth. This is a fair-sized village with a good many modern buildings, perched high on the hills and looking out southward across the plain of Esdraelon.

There was a garrison at Nazareth of one regiment from the 3rd Division and a field ambulance hospital. This latter was pitched at the summit of a hill which was almost inaccessible to motor ambulances. At the foot of this very hill in most convenient buildings belonging to a Roman Catholic convent was a small regimental hospital of the Connaught Rangers. The good ladies of the convent not unnaturally preferred their co-religionists

from Ireland to a mixed crowd of British and Indians, but it was hardly fair that the larger and more important hospital should be in the very inferior building. With a recommendation that the field ambulance should be moved we passed on.

Time was pressing if we were to get home before night, so we had no time to visit Samaria or Nablus *en route*.

From Jenin, on the south side of the plain, to Tul Koram, we followed the road by which the Turks had retreated after the battle. It was still littered with the débris of an Army. None of their transport had been able to pass the cordon of cavalry which had intercepted them at the point where the road emerges into the plain.

On reaching Tul Keram we found conditions very different from what they had been when we came north a few days before. The rains had begun and the roads had become almost impassable in places. Our second car had broken down and had been left behind at Tiberias. In the other we ploughed on in the growing darkness, until at last with a final plunge into a swamp we stuck hopelessly. After a long wait another car came up and took us on, only itself to stick in turn just as we were getting into Ludd. After another long wait of over an hour our own car turned up, having been towed out by the Commander-in-Chief's second car which happened to come along. We did not get home to G.H.Q. before 11 at night.

During our absence Aleppo had fallen on October 27 to the 5th Cavalry Division. Four days later the Turks asked for and were granted an armistice. This was followed on November 11 by the Armistice with Germany.

With the cessation of hostilities arrangements had at once to be considered for a new disposition of the troops and these of course involved medical changes also.

The medical situation, though still giving cause for anxiety was better. Considerable difficulty had been experienced in getting the third hospital ship started. One of the causes of this difficulty was that by recent arrangement with the enemy it was necessary for every hospital ship to carry a Spanish Commissioner to guarantee its *bona fide* use. Perhaps not unnaturally in view of previous experience, it was not very easy to persuade a Spaniard to sail the Mediterranean at this time, even though the Germans had granted their kind permit for him to do so.

(To be continued.)

Current Literature.

SNEATH, P. A. T., KERSLAKE, E. G., and SCRUBY, F. **Tetanus Immunity: the Resistance of Guinea-pigs to Lethal Spore Doses Induced by Active and Passive Immunization.** *American Journal of Hygiene*, vol. 25, pp. 464-476.

The authors began by elaborating a technique for preparing and counting suspensions of small numbers of viable tetanus spores. They then showed that tetanus could be induced in guinea-pigs by injecting spore suspensions mixed with an equal quantity of 50 per cent calcium chloride solution, and found that a dose of from three to fifty spores gave 100 per cent fatal results in unprotected animals. This they called the *lethal spore dose*, and was the standard inoculum used in subsequent experiments. It was considered that this dose probably afforded a fair comparison with the dose of spores likely to be introduced into a wound in a naturally acquired infection.

Having established these indispensable preliminary methods and facts, the authors proceeded to evaluate the various methods of protection.

Passive protection was evoked in guinea-pigs by the intraperitoneal injection of 1,500 units of antitoxin (presumably American units, and therefore equivalent to 3,000 international units) immediately after the introduction of lethal spore doses. This is, relatively speaking, an enormous dose of antitoxin. In spite of it, of 20 guinea-pigs tested with a lethal spore dose of approximately 21 spores, 5 died, 10 showed signs of modified tetanus, and only 5 were completely unaffected. A further series of 19 guinea-pigs was given the massive dose of 150,000 spores. Of these 11 died, 4 showed signs of modified tetanus, and 4 were unaffected.

Active immunization was effected by inoculation with various forms of tetanus toxoid. It was found that unaltered toxoid, although affording considerable protection, was inferior to alum precipitated toxoid, especially when the latter was given in two doses with four weeks' interval. Eighteen animals inoculated in this last way were completely unaffected by lethal spore doses administered at a later date.

Antitoxin development in actively immunized guinea-pigs was next estimated. The serum of un-immunized animals was found to contain about 0·001 unit of antitoxin per cubic centimetre of serum. Fifty-two guinea-pigs were immunized in varying degrees, and the antitoxin content of the serum estimated. It was found to range from 0·001 up to 1 unit per cubic centimetre. Lethal spore doses were then administered. Forty-five animals with an antitoxin content of over 0·01 unit per cubic centimetre all survived. Of seven animals showing an antitoxin content ranging from 0·001 to 0·01 unit per cubic centimetre, four died. The critical level of antitoxin for purposes of immunization in guinea-pigs would, therefore,

appear to be about the level of 0.01 unit (American) per cubic centimetre of serum. Since infection with *Cl. tetani* is a localized process, it is probable that such an antitoxic level as will prevent the manifestation of tetanus in guinea-pigs would also be sufficient to prevent the disease in man.

These observations are of great interest and importance in relation to the question of active immunization of man against tetanus.

Henry Lester Institute of Medical Research (Shanghai). Annual Report, 1936.

The report of the Henry Lester Institute for 1936 records steady progress in the work carried on from last year.

In the Department of Medicine, attention has been centred on nutritional diseases, particularly on the relationship of beri-beri and vitamin B₁ deficiency, as evidenced by the pyruvic acid content of the blood. A summary is given of the more important conclusions which have been drawn.

In the Division of Physiological Sciences, dietary surveys and chemical and spectroscopic analyses of Chinese foodstuffs have been continued. A third edition of "Chinese Medicinal Plants" has been published.

The greatest volume of work appears to emanate from the Division of Pathological Sciences, where investigations have been conducted on a diversity of subjects.

"Vi" antigen was present in seventy-three out of seventy-six locally-isolated strains of *Bact. typhosum*.

It is claimed that a "Vi" component has been discovered in the antigen of *V. cholerae*. "Vi" strains of *V. cholerae* do not, however, produce better immunity than strains devoid of "Vi" antigen. The "O" antigen appears to be the essential element for immunization.

Further studies were made of the new curative serum for typhoid fever, thirty-two patients being so treated during the year. Of a total of fifty-six patients who have now been treated in this way, thirty-two are said to have been benefited, the improvement being evidenced by a fall in the fever and a decrease in toxic symptoms.

The melanin test in malaria has been found to be highly unspecific.

Numerous interesting observations in protozoology, helminthology, and entomology are recorded.

References to many other subjects, of interest to students of tropical medicine, are to be found in this report, and the Henry Lester Institute is to be congratulated on another fruitful year of work.

GUNNISON, J. B., & MARSHALL, M. S. Adsorption of Bacteria by Inert Particulate Reagents. *J. Bacteriology*. 1937, v. 33, 401-9.

The use of various adsorbents in the treatment of colitis and other intestinal diseases led the authors to study the removal of bacteria by these reagents *in vitro*. Counts of bacterial suspensions and of control

tubes were made after incubation in the presence of the reagents usually at varying pH values. *Bact. coli*, *Cl. welchii* and *L. acidophilus* were tested with kaolin, Lloyd's reagent, charcoal, CaCO_3 , $\text{Al}(\text{OH})_3$ and BaSO_4 , —the only marked adsorption noted was that of *L. acidophilus* by charcoal. Kaolin removed staphylococci, sarcina and *B. subtilis*. It is believed that any intestinal changes following the use of these substances are probably due to factors other than removal of bacteria.

J. C. CRUICKSHANK.

Reprinted from "*Bulletin of Hygiene*," Vol. 12, No. 9.

BURGERS. Chemotherapie der Streptokokkenerkrankungen durch Prontosil. [The Chemotherapy of Streptococcal Disease with Prontosil.] *Deut. Med. Woch.* 1937, v. 63, 672-5.

This is a useful and comprehensive summary of the clinical and experimental work done up to date on Prontosil both in Germany and elsewhere. Although the author and his co-workers have taken a leading part in the experimental study of this new drug the paper only describes in general terms the investigations carried out in Dr. Bùrgers' own department. A few experiments are described in brief. On the basis of animal experiments comprising 112 rabbits, 85 guinea-pigs and about 500 mice the conclusions of von Domagk were confirmed that the substance has no direct bactericidal action on streptococci or pneumococci nor forms any bactericidal compound when coupled with the proteins of serum. Streptococci may be exposed to prolonged contact with Prontosil in the test-tube without the virulence of subsequent subcultures being affected. Prontosil-treated (and permeated) streptococci, however, when introduced into the peritoneal cavity of mice rapidly acquire the capacity of taking up vital strains to a greater extent than non-treated streptococci, and it is believed that the action of Prontosil is in part at least to be ascribed to its ability to produce a change in the permeability of the bacterial cell. In all experiments the drug increased the phagocytic reactions of animals and this was so even when the streptococci were treated in the test-tube before their injection into animals.

It is concluded that Prontosil is a powerful chemotherapeutic agent, that Prontosil treatment is the method of choice for streptococcal infections and that it has a prophylactic as well as a therapeutic application.

C. C. OKELL.

Reprinted from "*Bulletin of Hygiene*," Vol. 12, No. 9.

Reviews.

HEALTH AND MUSCULAR HABITS. By Lieutenant-Colonel J. K. McConnell, D.S.O., M.C., and F. W. W. Griffin, M.A., M.D.
London : J. and A. Churchill, Ltd. 1937. Pp. viii + 159. Price 5s.

This book is written on the well-known theme of *mens sana in corpore sano*, but the treatment of the theme is unusual.

The authors describe various bad muscular habits which are not realized to be such by individuals exhibiting them, and which lead to faulty posture and carriage and danger of consequent bad effects not only on the abdominal and thoracic viscera, but also on the psychological outlook on life in general. Such habits and their correction are clearly described, the descriptions being amplified by well-drawn practical diagrams. Emphasis is laid on the necessity for the cultivation of "athletic-mindedness" so that the tendency to leave physical training behind at the door of the gymnasium may be checked, and the subconscious mind trained to correct bad muscular habits automatically.

The book is written in non-technical language and anatomical descriptions are avoided as it is designed to appeal mainly to the lay individual.

Nevertheless, the author's explanations of the underlying muscular causes in some cases of lordosis, rounded shoulders, flat foot, etc., provide instructive reading to all who are interested in the subject. D. C.

THE BRITISH ARMY : ITS HISTORY, CUSTOMS, TRADITIONS AND UNIFORMS.
By Pay-Lieutenant-Commander E. C. Talbot-Booth, R.N.R. London : Sampson Low, Marston and Co., Ltd. 1937. Pp. xvi + 512. Price 7s. 6d.

A glance at the list of contents gives an indication how great and how varied is the information contained between the appropriately red-coloured covers of Pay-Lieutenant-Commander Talbot-Booth's small volume "The British Army."

To those who in these days of pacifism and defeatism are bold enough to admit that the glorious deeds of our armies in the past still give them that "school-boy" thrill, and who are ever eager to learn the intimate traditions and customs of the regiments who took their share in conquering and maintaining our Empire, this book will be a source of the greatest pleasure and interest.

The first half deals generally with the history and present constitution of the Army, its uniforms and arms during various periods of its existence, with notes on military badges, decorations and ceremonials, while the second half, after giving a list of regimental nick-names and old titles, contains the life-history of every regiment and unit of the British Army.

There are numerous illustrations, both coloured and in black and white.

We strongly recommend that this handy encyclopædia of the Army

should be given a place beside such useful publications as the "Army List," "Games and Sports in the Army," "Who's Who," and, if we belong to the upper class, "Debrett's."

SYNOPSIS OF OBSTETRICS AND GYNÆCOLOGY. By Aleck W. Bourne, M.A., M.B., B.Ch., F.R.C.S.Eng., F.C.O.G. Bristol: John Wright and Sons, Ltd. 1937. Seventh Edition. Pp. 438. Price 15s.

The last edition of this book was published in 1935, but even in so short a time the discovery of new methods or treatment such as Prontosil in puerperal sepsis and mandelic acid in urinary infections has rendered the publication of a new edition advisable.

The book is primarily intended for senior students revising their work for examination purposes, but the clear and concise arrangement of the subject matter renders it also extremely useful for the busy practitioner who wishes to refresh his memory on some point in diagnosis or treatment.

There are numerous small but very clearly drawn diagrams and illustrations included in the text, which add much to the usefulness of the book, especially for students.

The author has succeeded in compressing the whole subject of obstetrics and gynæcology into some 400 pages without omitting any essential point which the student need know.

E. C. L.

Correspondence.

ELASTOPLAST AS A DRESSING AFTER VACCINATION.

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

DEAR SIR,—I think the following notes may be of interest to medical officers :—

When in Glasgow two years ago, I went into the M. I. Room and found Dr. Law—a civil medical practitioner employed at the Military Hospital—vaccinating some recruits. I was rather surprised to see him dressing their arms with strips of elastoplast bandage. He assured me that since using this dressing, he had had no septic arms.

Since coming to the Royal Military College in September 1935, I have adopted this method and it has been used by my assistant medical officer, Major D. C. Scott. The results have been so striking that I feel the method is worth giving a more extended trial than is possible here.

During this period, 42 officers, 37 cadets, 39 other ranks, 50 women and 51 children—a total of 219—have been vaccinated and dressed by this method.

The points which stand out from this small number of cases are briefly :—

- (1) Complete absence of sepsis. No case had to miss a single day's duty as a result of vaccination.

- (2) Almost universal successful results. One baby failed twice, but "took" the third time.
- (3) Marked diminution of scarring, particularly important in women and female infants.
- (4) Almost complete absence of malaise in infants, and there is no interference with bathing.

The method employed was the ordinary routine, except that the linear scratches were covered with a strip of elastoplast overlapping the scratches by about one inch, instead of the usual gauze and zinc oxide plaster.

This dressing can be left on till it falls off, when the scabs usually fall off as well. There is no need to remove the dressing to see if the vaccination has taken, as the weals can be seen and felt through the elastoplast.

From my experience here, I am of the opinion that it would diminish the period of inefficiency following vaccination often incurred by recruits, and that it would be specially valuable in the event of mobilization, when it is essential to cut down all avoidable inefficiency.

*Royal Military College Hospital,
Camberley, Surrey.
September 9, 1937.*

*I am, etc.,
P. JACKSON,
Lieut.-Col., R.A.M.C.*

Notices.

CHADWICK PUBLIC LECTURES.

Date and Time	Place	Lecturer	Subject	Chairman
1937. November. Tuesday, 2nd. 5.30 p.m.	LONDON. Manson House, 26, Portland Place, W.1	J. M. H. MacLeod, Esq., M.A., M.D., F.R.C.P.	MALCOLM MORRIS MEMORIAL : Leprosy in Great Britain at the Present Time	Sir Harold Morris, K.C.
Tuesday, 16th, 5.15 p.m.	Manson House, 26, Portland Place, W.1	Bernard Myers, Esq., C.M.G., M.D., F.R.C.P.	Third Lecture of the " Silver Jubilee " Course of Lectures by Representatives of the Dominions —New Zealand : The Promotion of Health in the Empire Citizen	To be announced
Wednesday, 24th, 5.15 p.m.	London School of Hygiene, Gower Street. W.C.1	Pointon Taylor, Esq., F.R.I.B.A.	Town-Planning and Town-Dwelling	To be announced
December. Tuesday, 7th, 5.15 p.m.	London School of Hygiene, Gower Street, W.C.1	Dr. William Butler, Formerly Senior Medical Officer, L.C.C.	The Thames Estuary and the Problem of Sew- age Disposal of Greater London	Sir George W. Humphreys, K.B.E., M.Inst.C.E., Chadwick Trustee

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PROGRAMME OF LECTURES

1937-1938.

AT 3 P.M.

(unless otherwise stated.)

- Wednesday, November 10.—“The Self-Defence of Merchant Ships in War.” By Commander J. Creswell, R.N. Admiral The Earl of Cork and Orrery, G.C.B., G.C.V.O., A.D.C., in the chair.
- Wednesday, November 24.—“Army Recruiting.” By Major-General M. G. H. Barker, C.B., D.S.O., Director of Recruiting and Organization. The Right Honourable Leslie Hore Belisha, P.C., M.P., Secretary of State for War, in the chair.
- Wednesday, December 1.—“The Influence of Sea Power on the Fighting in Spain.” By Vice-Admiral C. V. Osborne, C.B., C.M.G. Admiral Sir R. G. O. Tupper, G.B.E., K.C.B., C.V.O., in the chair.
- Wednesday, December 8.—“Balloon Aprons.” By Air Commodore J. G. Hearson, C.B., C.B.E., D.S.O. Air Chief Marshal Sir Hugh C. T. Dowding, G.C.V.O., K.C.B., C.M.G., in the chair.
- Wednesday, December 15.—“Germany of To-day.” By Dr. E. Woermann. Minister Plenipotentiary, Counsellor of Embassy. General Sir Felix Ready, G.B.E., K.C.B., C.S.I., C.M.G., D.S.O., in the chair.
- Wednesday, January 5.—“The Training of a Royal Air Force Pilot.” By Air Vice-Marshal L. A. Pattinson, D.S.O., M.C., D.F.C. Air Marshal W. G. S. Mitchell, C.B., C.B.E., D.S.O., M.C., A.F.C., in the chair.
- Wednesday, January 26.—“Imperial Air Routes.” By Lieutenant-Colonel H. Burchall, D.S.O. Marshal of the Royal Air Force, Sir John Maitland Salmond, G.C.B., C.M.G., C.V.O., D.S.O., D.C.L., LL.D., in the chair.
- Wednesday, February 9, at 5 p.m.—“The Development of the Territorial Army.” By Major-General W. D. S. Brownrigg, C.B., D.S.O. General Sir W. M. St. G. Kirke, K.C.B., C.M.G., D.S.O., in the chair.
- Wednesday, February 23.—“The Officers Training Corps.” By Lieutenant-Colonel The Viscount Bridgeman, M.C., *p.s.c.* Major-General E. K. Squires, C.B., D.S.O., M.C. in the chair.
- Wednesday, March 2.—“International Legal Aspects of Bombardment by Sea and Air.” By Philip A. Landon, Esq., M.C., M.A. Lieutenant-General Sir George Macdonogh, G.B.E., K.C.B., K.C.M.G., in the chair.
- Tuesday, March 8, at 3.20 p.m.—The Anniversary Meeting. General Sir Felix Ready, G.B.E., K.C.B., C.S.I., C.M.G., D.S.O., Chairman of the Council, in the chair.

Wednesday, March 9.—“The Military Engineer in Modern Warfare.” By Major-General L. V. Bond, *p.s.c.* Lieutenant-General Sir Hugh Elles, K.C.B., K.C.M.G., K.C.V.O., D.S.O., in the chair.

Wednesday, March 16.—A Discussion on “Speed and Gun Power in Warships.” to be initiated by Captain E. Altham, C.B., R.N. Admiral Sir Charles M. Forbes, K.C.B., D.S.O., in the chair.

Wednesday, March 23.—“The Frontier Policy of the Government of India.” By Lieutenant-Colonel Sir Ralph Griffith, K.C.S.I., C.I.E. Field-Marshal Sir Philip Chetwode, Bt., G.C.B., C.M.G., C.S.I., K.C.M.G., D.S.O., in the chair.

ROYAL SANITARY INSTITUTE.

COURSE OF TRAINING IN THE INSPECTION OF MILK PASTEURIZING PLANTS.

IN view of the Government's new milk policy and the likelihood of the granting to local authorities of powers to enforce pasteurization the efficiency of the pasteurizing process becomes of great importance. Medical officers of health and sanitary inspectors will, therefore, be interested to know that a second course of training in the inspection of milk pasteurizing plants has been arranged by the Royal Sanitary Institute. This course will be given on Thursday and Friday, November 25 and 26, and will be open to members and associates of the Institute. The number of students is limited and early application for admission is therefore essential. Applications should be made to the Royal Sanitary Institute, 90, Buckingham Palace Road, London, S.W.1.

NINTH INTERNATIONAL CONGRESS OF MILITARY SURGEONS AND PHARMACISTS.

WE are informed by Lieutenant-Colonel A. F. C. Martyn that the paper on the “Organization and Function of the Medical Services in Combined Operations on Land and Sea,” read at the Ninth International Congress of Military Surgeons and Pharmacists, was prepared in conjunction with Surgeon-Commander A. W. North, R.N., Medical Department of the Admiralty.

EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects travel, and personal experiences, etc.

Correspondence on matters of interest to the Corps, and articles of a non-scientific character, may be accepted for publication under a nom-de-plume.

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Communications in regard to editorial business should be addressed: "The Editor, JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, War Office, Whitehall, London, S.W. 1."

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December, 1937.

UNIVERSITY OF CHICAGO Vol. LXIX.

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MONTHLY

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Royal Army Medical Corps.

Original Communications.

A.M.D.3.

BY MAJOR R. F. WALKER, M.C.,
Royal Army Medical Corps.

"A general knowledge will be required of the general system of the Organization and Administration of the land forces of the United Kingdom." — K.R., Appendix XI, II Subject (b) Part I.

To the average officer of the R.A.M.C., more especially the juniors, the activities of the Army Medical Directorate are shrouded in mystery.

An account of the activities of one branch (A.M.D.3) of the Medical Directorate is the subject of this article and it is hoped that it will help to dispel some of the mystery and aid junior officers in the attainment of that general knowledge of the system of administration which is required by King's Regulations.

Let me say at once that though, on the surface, the work may appear dull and uninteresting for a medical officer to have to carry out, there is, in fact, a wealth of interest, general and medical, and one can see the result of one's labours, which cannot be said for many other jobs in the scheme of things.

ORGANIZATION.

The duties of the branch are divided under two distinct headings : Part I : The Supply of Medical Equipment ; Part II : Medical Questions Relating to Officers.

PART I.—THE SUPPLY OF MEDICAL EQUIPMENT.

Under this heading the work of the branch includes :—

Supply, inspection, issue and disposal of every type of Medical Stores.

Examination of cash accounts.

Organization and supervision of Army Medical Stores.

Preparation and revision of schedules of medical equipment.

Recommendations for the placing of Contracts for medical equipment.

Patterns of medical equipment and apparatus and inventions relating thereto.

Supply of vaccines and sera.

Supply of artificial limbs.

Estimates of expenditure.

Price list of medical equipment.

To carry out this work there are in addition to the R.A.M.C. Officer, two Pharmaceutical Chemists, graded as the Inspector and Assistant Inspector of Medical Supplies, and six ex-Soldier (R.A.M.C.) Clerks.

A glance at the Priced List of Medical Equipment will show the vast range of items, literally "from a needle to an anchor," supplied by the branch. The anchor in this case is part of the Samway's tourniquet.

There are about 4,000 items in the Priced List and these cover the requirements not only of the physician and the surgeon, but also those of the dentist, the gynæcologist, ophthalmologist, otologist, pathologist and the radiologist. Many of these specialists' requirements are a study in themselves and the branch is conscious that, unaided, it could not possibly contain all the knowledge required to deal intelligently with the needs of every officer. Accordingly the Director of Pathology, Consulting Surgeon, Consulting Physician and Specialist officers in all branches are fully consulted.

In X-ray matters the Inter-Services X-ray Advisory Committee composed of Civil, Naval, Military and Air Force experts meets at regular intervals under the Chairmanship of the Consulting Surgeon and advises on all matters pertaining to X-ray equipment and its use.

The assistance given so generously by all these gentlemen is hereby gratefully acknowledged, for without it the usefulness of the branch would be gravely impaired.

A.M.D.3 carries out many technical investigations. Recently it was found that the stock of surgical instruments, mostly old war stock, was getting out of date and that new instruments would be required on a considerable scale to carry out replacements and to meet demands for the new scale of instruments authorized under Appendix 25, Regulations for the Medical Services of the Army. It was desired to provide instruments which would give every confidence to the surgeon and stand up to very hard wear. Inquiries were made into the relative merits of carbon and

stainless steel and of machine and hand forging. A number of factories were visited and the methods and steps of manufacture examined closely from the bar of steel to the finished instrument. Methods of tempering and hardening were compared and the degree of hardness of each instrument when finished was ascertained. Tests were made with various makes of surgical scissors to find the number of cuts which could be made before the edges got blunt. From all the information so obtained it was possible to draw up a general specification, and to indicate which manufacturers would be expected to turn out instruments of the finest quality. Contracts were arranged accordingly.

An investigation is now being carried out to find an electric sterilizer which will be foolproof, able to stand hard wear and be convenient to use. The sterilizers in use at various military hospitals are reported on at intervals and the unsatisfactory makes are gradually eliminated. Investigation is continuing concerning safety devices which reduce the current automatically when the water boils and cuts it off entirely when the sterilizer is dry. Lids, instrument trays and water taps all have to be considered together with the thickness of metal, types of solder, design of heating elements, methods of insulation, and wiring. When all available information has been obtained a specification will be drawn up and a few sterilizers made to that specification will be tried out in selected hospitals. In the end it is hoped to produce a sterilizer which will give satisfaction wherever it may be used.

Finance.

In the autumn of each year A.M.D.3 prepares the Budget for the following financial year, which runs from April 1 to March 31. This budget includes an estimate of the money required to supply all peace hospitals at home and abroad (excluding India) with their everyday requirements. In addition estimates are included for new equipment it is proposed to supply to peace hospitals, and for mobilization requirements. These estimates undergo very careful scrutiny by the Finance Department and may be returned for amendment. A.M.D.3 is informed in March how much money has been authorized for expenditure during the next financial year and it is the duty of the branch to see that the amount authorized is not exceeded.

Contracts.

The purchase of drugs, dressings, surgical instruments, etc., is done through the Director of Army Contracts. The main contracts run for a period of three years. Schedules are prepared by A.M.D.3 and the estimated quantities of each drug or type of dressing required for one year are entered. The Schedules are then sent by the Director of Contracts to the more important manufacturing firms. When their tenders are received they are tabulated by the Contracts branch and then submitted to A.M.D.3 for remarks. Samples are called for by A.M.D.3, and carefully examined by the Inspector and Assistant Inspector of Medical Supplies. The

standards laid down in the B.P. and B.P.C. are taken as the guide to quality. For the big items, e.g. drugs and dressings, the contract is split between two or more contracts to ensure rapid supply. When a contract has been placed the schedule is returned by D.A.C. to A.M.D.3 so that the branch can check all bills received from contractors and thus ensure that the proper price is being charged.

All purchases by A.M.D.3 to the value of £50 and over must go through the Contracts branch, but for purchases under £50 A.M.D.3 is authorized to put out "local" tenders and accept the lowest commensurate with quality.

Supply, Inspection and Issue of Medical Stores.

In Appendices 25 and 26 of the Regulations for the Medical Services of the Army the authorized scales of non-expendible and expendible stores authorized for hospitals are laid down. Officers commanding hospitals are expected to keep their demands within the scope of these scales. Demands for unauthorized articles must be accompanied by an explanation of the circumstances which render them necessary (R.M.S.A., para. 375). During the past few years there has been a great increase in demands for proprietary drugs. It has been our experience that officers read about a new drug in the current medical literature and determine to try it out. A demand is submitted—the drug is tried for a short time and probably discarded and the remainder is left on the shelves of the hospital dispensary wasted. Such demands should therefore be kept down to a minimum. Current literature is carefully perused by the Branch and any drug that is likely to prove of value to the Army Medical Services is referred to the Consulting Physician and if he agrees samples are obtained for trial in one or more of the larger hospitals. Reports are called for at the end of the period of trial and on these reports a decision is made as to whether the drug shall be authorized or not.

Many weird and wonderful "quack" remedies are brought to our notice but, as it is an invariable rule that we must know the ingredients of all preparations authorized and as the inventors of those remedies are, in most cases, very loth to part with their formulæ negotiations break down.

Supplies of medical equipment are indented for by Officers Commanding hospitals on A.F.I. 1209. Indents are submitted half-yearly, the dates varying for the different commands so that the work of supply is spread evenly throughout the year (R.M.S.A., para. 378). In addition to the half-yearly indents an O.C. hospital may submit intermediate indents in the event of an unforeseen emergency but these indents should be avoided as far as possible (R.M.S.A., para. 380).

Owing to the liability to rapid deterioration X-ray films and organic preparations of arsenic are indented for quarterly (R.M.S.A., para. 379).

The necessity for a ready method of obtaining medical equipment urgently without reference to the War Office is obvious and so in cases of

emergency Officers Commanding hospitals, particularly abroad, are authorized to purchase medical equipment locally. The total value of such purchases averages about £600 per annum, most of which is accounted for by overseas stations. This is not an economical method of purchase as retail prices are necessarily charged and these compare unfavourably with War Office contract prices. An annual return of all purchases made is called for by A.M.D.3 and if any unaccountable increase in the amount expended at any station is detected an explanation is asked for.

These returns have more than once disclosed the fact that items not authorized by A.M.D.3 have been purchased locally and entered as emergency expenditure. Such a practice is to be deprecated.

When the I 1209s reach the A.M.D.3 they are checked and unauthorized demands extracted. The forms are then passed to the Army Medical Stores for "Marking." The storekeepers of the various sections of the Army Medical Stores mark off in red ink the items they can supply and these items are assembled and despatched to the hospital concerned. The forms are then returned to A.M.D.3 when the items not supplied by the Army Medical Stores are extracted and indents are sent from this branch to the contractors who hold the contract for the various items. The contractor then supplies the demand direct to the hospital.

The indent sent to contractors by the branch is accompanied by A.M.D.3, Form 2. The contractor enters on this form the items he has supplied and sends the form to the O.C. hospital with the stores. When the stores have been received at the hospital it is the duty of the O.C. to check them over with the form and if all is correct to sign the certificate at the bottom of the form and return it to A.M.D.3. No bill can be sent to the finance branch by A.M.D.3 for payment unless accompanied by this receipt.

When an indent has been sent to a contractor the Inspector or Assistant Inspector of Medical Supplies pays a surprise visit to the firms' premises. Samples are taken from the drugs actually set aside for dispatch to a hospital and these samples are sent to the Government Analyst for examination. Should the analysis not agree with B.P. requirements the contractor is notified and the supply stopped. It may be of interest to note that every batch of ether prepared for A.M.D.3 is passed by the Government Analyst before authority is given to the contractor to use the batch for meeting demands from hospitals.

It may have been noticed that recent supplies of ether to hospitals are contained in special tins with a patent brass seal at the top. In the past it was found that ether sent to hospitals in bottles, particularly to those in the tropics, rapidly evaporated and as much as 50 per cent was lost in store.

A.M.D.3 obtained samples of many types of tins which might be used for the packing of ether. Sets of these tins filled with ether were assembled at the Army Medical Stores, carefully inspected and each tin

weighed and numbered. Sets were sent to Khartoum and Hong Kong for storage tests under tropical conditions and one set was retained at the Stores. Reports were called for at three, six and twelve months, showing the condition of the tins and the weight of each tin found locally. At the end of twelve months the tins were returned to the Stores at Woolwich where they were carefully examined and again weighed under the same conditions as when first weighed there. A comparison of the first and last weights showed that whilst some tins had stood the test very well a number showed a considerable loss of weight. The Hong Kong set was sent to Jamaica for a further storage test. One batch of tins from the Hong Kong-Jamaica test showed no loss of weight and these were then sent to the Government Chemist for analysis of the ether. The analysis proved satisfactory and this method of supplying ether has been adopted. This test shows the amount of work that lies behind a seemingly simple change.

Sometimes, but very seldom, complaints are received from hospitals regarding the quality of drugs. On receipt of the drug complained of from the hospital, analysis is carried out as above and the contractor notified of the result. In this connexion it is very important that paragraph 383, R.M.S.A., be strictly complied with in hospitals.

Preparation and Revision of Schedules.

This is an important part of the work of A.M.D.3. It should be realized that a vast amount of work lies behind the publication in Army Orders of an amendment to schedules which perhaps occupies only two lines. Appendices 25 to 50, R.M.S.A., are constantly under revision. Suggestions for improvements submitted by medical officers are collected, investigated and, provided there is no administrative objection, included in the next revision. A glance at the Appendices in the present edition of these regulations will show that recent revisions have been considerable.

Organization and Supervision of the Army Medical Stores.

The Army Medical Stores are under the charge of a Senior Quartermaster, who is directly responsible to A.M.D.3.

The Staff consists of 1 Serjeant Major, 1 Quartermaster Serjeant, 2 Staff Serjeants, 2 Serjeants and 16 Other Ranks R.A.M.C. In addition there are 6 Storekeepers, 12 Assistant Storekeepers and a Cutler. The Stores are organized in six sections: Section I: Drugs and Tablets. Section II: Dressings, X-ray, Dental and Laboratory Equipment. Section III: Rubber Goods and Surgical Sundries. Section IV: Optical and Surgical Instruments. Section V: Field Medical Equipment. Section VI: Mobilization Equipment.

In Section I the work consists largely of breaking bulk into the smaller quantities demanded by hospitals and reception stations. Sections II and III are of no special interest. Section IV, in addition to the

working stock of instruments, is responsible for the "Sealed Pattern" Room. In this room patterns of every instrument and appliance authorized for the Medical Service are kept and Contractors go there to see exactly what they are expected to provide. Section V assembles all Field Medical Equipment. Composite articles of Field Equipment are not purchased already assembled. Take, for example, the Field Ambulance Pannier. The pannier itself is purchased from one Contractor, the containers from another, the thermometers from another, and so on. When Section V gets a demand for a Field Medical Pannier the Storekeeper indents on the other sections for the components of the pannier and he assembles these components and packs them into their places in the pannier. Section VI is responsible for mobilization units. Some of the larger units are retained in the Stores; others, when assembled, are sent out to Medical Mobilization Stores in Commands for storage, supervision and turnover (R.M.S.A., Paras. 424 to 430). A note on the storage of rubber articles is worthy of mention. A prolonged test has shown that the most satisfactory method of prolonging the life of rubber goods is to store them in an air-tight cupboard, fitted with perforated metal shelves, in which is placed a basin full of ordinary paraffin oil. The articles which are thus in a paraffin laden atmosphere should be massaged periodically.

The adequate turnover of mobilization equipment is of the greatest importance. This equipment must be ready for despatch at a moment's notice. All mobilization equipment must be inspected half yearly under arrangements made by the D.D.M.S. of the Command in which it is stored (R.M.S.A., Paras. 22 and 431).

PART II.—MEDICAL QUESTIONS RELATING TO OFFICERS.

The duties of A.M.D.3 under this heading include questions relating to:—

Wound pensions.

Sick leave, Medical Boards, invaliding, placing on half pay and retirement.

Causation of disabilities in officers and nurses.

Complaints as to the proceedings of Medical Boards on officers.

Physical fitness of candidates for commissions.

Candidates medically unfit at the Army Entrance Examination.

Appeal Medical Boards.

Wound Pensions.

The Ministry of Pensions deal with all officers who retired on account of ill-health caused by wounds received in the War. There are, however, a number of officers whose wounds were not such as to necessitate their retirement, and in such cases where there is any question of renewal or increase of wound pension, due to worsening of the condition of the wound, A.M.D.3 arrange for examination by a Medical Board, for report on A.F.A 45 and 45A.

Sick Leave, Medical Boards, Invaliding, Placing on Half Pay and Retirement.

When an officer requires leave on Medical Certificate A.F.B. 175 is completed by the Medical Officer (K.R., 1514). If he is unable to rejoin at the termination of this leave and he is not on the strength of a unit at home his case is referred to A.G.4a at the War Office. A.G.4a pass the papers to A.M.D.3 for decision as to whether the officer should appear before a medical board. If the officer is on the strength of a unit at home the board is arranged by the Command in which the unit is stationed. There are two classes of Medical Boards : (a) Command Medical Board ; (b) War Office Medical Board. A.M.D.3 decide before which tribunal the patient shall appear.

Usually the case is first examined by a Command Board. This is arranged by A.G.4a, through the G.O.C. of the Command in which the officer is serving. When the Board papers are received back in the War Office they are dealt with by A.G.4a in the first instance and then passed to A.M.D. 3, F.2 and F.3 for a decision on two points : (a) Is the disability due to military service ? (b) Under which heading of Article 445 or 469 of the Royal Warrant for Pay is the grant of full pay during sick leave admissible ?

These are two important decisions from the officer's point of view and require careful consideration. Many points have to be gone into and, for this reason, it is very essential that medical boards give as full details as possible in the answers to all the questions on A.F.A 45 particularly Questions 12 and 13 (R.M.S.A., para. 494).

If the disability is held attributable to military service the officer is entitled to a refund of reasonable medical expenses that he may incur in the treatment of his disability provided such treatment has not been available from military sources. For example an officer suffering from pulmonary tuberculosis, if his disability is attributable his sanatorium expenses are paid up to a maximum of £6 6s. per week less appropriate hospital charges. If the disability is not attributable he must defray such expenses himself.

The Pay Warrant prescribes certain limits to the period of absence from duty on account of medical unfitness during which full pay may be drawn in ordinary cases. In very special cases, such as loss of health due to tropical service or to active operations, the normal periods of absence from duty during which full pay is admissible may be extended.

Many lengthy Minutes have been written in some cases on these two points before agreement has been reached between A.G.4a, F.2, F.3 and A.M.D.3.

When an officer is nearing his full period of sick leave on full pay arrangements are made to have him examined by the War Office Medical Board.

This Board is held in London and consists of the Deputy Director-

General as Chairman, the Consulting Surgeon and Consulting Physician as members. If any cases of nervous disabilities are to appear an additional member (an eminent civilian neurologist) attends.

There are only two categories as regulations stand at present : (a) Fit for General Service. (b) Unfit for General Service. Only in very exceptional cases and for some special reason is the Board asked to answer Question 25 (1) : " Is the officer fit for service at home ? "

Medical Boards, therefore, place all cases appearing before them under one of the following headings : (a) Fit for General Service. (b) Unfit for General Service. In this case a period of sick leave is recommended. (c) Permanently unfit for General Service.

When an officer, who is on the strength of a unit at home, is marked fit, the President of the Board should instruct him to report himself for duty forthwith (Regulations for the Medical Services of the Army, para. 478). If the officer is on the strength of a unit abroad orders are issued to him by the War Office.

In the case of an officer on the strength of a unit at home marked unfit by a Command Board the G.O.C. can grant him sick leave up to six months but the Board proceedings must, in all cases, be forwarded to the War Office for perusal by the branches concerned. If the officer marked unfit is on the strength of a unit abroad A.G.4a, after consultation with A.M.D.3. notify him of the sick leave granted.

All officers on sick leave must render a " twenty days report " ; that is they report to their O.C. in writing if on the strength of a unit at home, and to the War Office, if on the strength of a unit abroad, within twenty days of the termination of the sick leave granted them. When these reports are received arrangements are made for re-examination by a Command or War Office Board.

With regard to the granting of sick leave, R.M.S.A., para. 498, states " Sick leave will be granted to Officers in accordance with King's Regulations and the Pay Warrant. It will only be recommended when there is a reasonable prospect that the Officer will ultimately be fit for General Service ; consequently Officers who are permanently unfit are not eligible for the grant of sick leave."

When an officer has been on sick leave up to the maximum period for which full pay is admissible and is still unfit for General Service he is placed on Half Pay under the terms of Article 497 of the Royal Warrant. This article reads " Subject to Article 552¹, an officer who is certified by the regulated medical authority to be medically unfit for service may be placed on the half-pay list when he has exhausted the period of sick leave on full pay to which he is entitled for such period, not exceeding five years, as our Army Council may determine."

¹ Article 552 states that an officer, whether on full pay or half pay, who is pronounced by the regulated medical authority to be suffering from definitely established mental disease shall be retired from the Army.

Normally an officer may remain on the half-pay list for five years, if he remains unfit for so long, but under Article 512, the grant of half pay, in the case of an officer placed on the sick list on account of a non-attributable disability is dependent upon the length of the officer's service.

An officer on half pay can apply at any time for re-examination as to his fitness for General Service. This re-examination is carried out by the War Office Medical Board.

When an officer is marked Permanently Unfit for General Service he is gazetted out as early as possible. This is usually ten days after the date of the Board which marked him P.U.G.D.

Causation of Disabilities in Officers and Nurses.

This subhead can be summarized in the one word "attributability." It entails much investigation and Minute writing in many cases before agreement is reached between the branches concerned. Tropical diseases, e.g. malaria, typhoid, dysentery, etc., when contracted during service abroad are as a general rule accepted without question as attributable to military service, but pulmonary tuberculosis, pneumonia and pleurisy are in a very different category and much investigation is required before it can be decided whether they are attributable to military service or not. The advice of the Consulting Surgeon and Consulting Physician, always freely given, is a great help in these cases.

Complaints as to the Proceedings of Medical Boards on Officers.

This heading can be dismissed very shortly. Complaints are few and far between, but occasionally an officer who is keen to get back to duty is disgruntled at having been given further sick leave. Very few complaints are received from officers at having been marked fit.

Physical Fitness of Candidates for Commissions.

The standards of physical fitness for candidates for commissions are laid down in Appendix 11A of the Regulations for the Medical Services of the Army.

A Medical Board for candidates for the Regular Army, e.g. entrance to the Royal Military Academy and the Royal Military College is held twice yearly at the Central Recruiting Depot, London, and at the Royal Military College, Sandhurst, for candidates seeking regular commissions from the Territorial Army and the Supplementary Reserve.

This Medical Board places the candidates under one of the following categories :—

(a) Fit.

(b) (i) Unfit but suffering from a defect which can be cured by treatment. In this case if the candidate has been successful in the Army Entrance Examination he is re-examined by a Medical Board after such treatment.

- (b) (ii) Unfit by reason of insufficient height, chest, girth, etc. In this case if the Board considers that he is likely to attain the required standard before the time comes for him to be appointed to a commission, he is recommended to be allowed to join the cadet college subject to the condition that, unless at the end of the course he is found to reach the standard which his increased age and height demand, he will not receive his commission.

(c) Unfit.

It is very interesting to read the summary of these boards and compare the physique of boys from the different public schools. It is worthy of note that the number rejected under Category (c) is gradually tending to diminish.

Appeal Medical Boards.

Candidates who have been marked Unfit (c) have the right to appeal to be examined by the Appeal Medical Board.

This board consists of the Director-General, Army Medical Services, as Chairman, with eminent civilian medical men as members.

The chief cause for rejection by these boards is vision, despite the very low standard required ($\frac{9}{16}$ each eye correcting up to $\frac{1}{8}$ better eye, $\frac{1}{12}$ worse eye).

CONCLUSION.

It is realized that this article is very sketchy. One would have liked to expand on the subject of Mobilization in Part I, but, for obvious reasons, that could not be done.

The interest in Part II—the Medical side—is very real. One meets with difficult cases which cause much search for knowledge in the books of the War Office Library, for, before a Minute is written, one must be very sure of one's ground. The written word can turn round and bite the writer. Many interesting human documents are contained in War Office files. It is possible to follow the life history of an officer from the day he first made application, in his unformed schoolboy handwriting, to sit for the entrance examination, right through his service to the date of his retirement and oftentimes even after that. At every stage of his career, from the day he joins to the day he retires, some aspect of his service requires the attention of A.M.D.3.

THE MEDICAL SERVICES OF WILLIAM THE THIRD'S ARMY.

BY LIEUTENANT-COLONEL G. A. KEMPTHORNE, D.S.O.,
Royal Army Medical Corps (R.P.).

AFTER the flight of James the Second and the accession of William of Orange, the soldiers were in a bad temper. They had been given no opportunity to influence the political situation or to show themselves in the field, a fact which William's Dutch troops were not slow to rub in. Their loyalty to the new régime was obviously a doubtful quantity.

The New Model disbanded at the Restoration had been the finest force in Europe; its soldiers were regarded by the people with respect, its administration was effective and reasonably honest. In the Restoration Army, however, jobbery of the worst kind and of a nature most subversive to discipline prevailed. The officers were robbed by the officials and were tempted for their livelihood to retaliate on the men. Their pay consisted of "subsistence" supposed to be paid when due, and "arrears" which, after various deductions, they might see months or even years later. The pay of the infantry private was 8d. a day. Of this 2d. was stopped for his clothing, for which his colonel was the contractor; he gave a day's pay to Chelsea or Kilmainham Hospital; from the remainder he paid stoppages for his rations and such other stoppages as his colonel might determine. The value of rations was stated in Parliament at this time to be 4d. a head per diem.

Parliament, which pretended to ignore the existence of a standing army, resisted every attempt either to secure the enforcement of discipline by military law or to provide housing accommodation. A writer from Rochester in 1690 stated: "The complaints of the poor sick seamen and soldiers increase, partly from ill payments, which make people refuse to lodge them, partly from their great number. Within a few days two or three have died in the streets from want of quarters and many more would had not the mayor lodged them in the town hall on straw and private charity relieved them. There are at least 700 sick who beg in the streets from door to door."

The soldier's engagement was usually for life, but, as regiments were frequently disbanded at the conclusion of a campaign, there was no real security of tenure. In such a case the discharged soldiers were given passes entitling them to casual relief till they reached their place of legal settlement when they came on the parish. Invalids from abroad might secure treatment from the local apothecaries at the place of disembarkation.

Some of the latter's bills are among the Treasury Papers. At other times local charity relieved them. In 1690 St. Bartholomew's Hospital petitioned for £945 for nursing and curing sick soldiers which their officers and their agents deferred paying. The seamen seem to have been more systematically cared for by the Commissioners for Sick and Wounded who provided seamen's hospitals.

During the great concentration of troops on Hounslow Heath in James the Second's reign a military hospital was built there. This, however, was an exceptional measure and we hear no more of it. Owing to billeting difficulties, regiments at home were usually on the march and sick unable to proceed were left to be cared for, or otherwise, locally. In case of any prolonged stay, a house was usually hired for a regimental hospital by the surgeon who was allowed by Government a grant of 12d. a head a year for "external and internal medicines."

Count de Solmes in a report from Ireland in 1691 stated that both officers and men complained greatly of the way the authorities raised money for the hospitals by deducting money from their pay when they were wounded. An order had been issued the year before for the stoppage of a farthing a day from the infantry and dragoons and a halfpenny from the horse for these war hospitals, additional to the day's pay already deducted.

The Royal Hospitals at Chelsea and Kilmainham, the last building in 1681, provided help either as in- or out-pensioners to a strictly limited number of aged and crippled soldiers. There is also a record of smart money paid to officers and men wounded in the suppression of Monmouth's Rebellion. In the case of two captains who each lost a leg at Landen in 1693, they were given a year's pay (£150), but it was expressly stated that this was not to be regarded as a precedent.

The regimental surgeons and their mates owed their commissions and warrants to the patronage of their colonels. In England commissions before being signed were supposed to be approved by the Surgeon-General.¹ Besides the regimental surgeons there were doctors appointed to fortresses which had permanent garrisons. The general hospitals formed on active service were staffed by persons in civil practice.

The physician's art was evidently not so completely divorced from that of the surgeon as in rather later years. Some of the regimental doctors described themselves as physicians and surgeons to their units. As late as 1702 Dr. Joseph Gaylard, appointed Physician-General to an expedition to the West Indies, claimed in a subsequent memorial to the Treasury that

¹ Since the reign of Charles I surgeons' mates for the Royal Navy had been compelled to pass an examination held by the Company of Barber Surgeons. This procedure was not applied to the Army till the formation of the Surgeons' Company in 1745.

he and his man also assumed the duties of surgeons. It seems to have been thought necessary, however, to introduce a bill in Parliament in 1689 to allow surgeons to administer medicines to wounded persons.¹ Physicians and Surgeons-General were gazetted both to the three establishments in England, Scotland and Ireland and to every considerable expeditionary force. James Pearce, Surgeon-General in England since 1681, a terrible old scandal-monger, was relieved of his post by Van Loen in 1689, four years before his death. He had been also Senior Surgeon to the Navy and Surgeon to the last two Sovereigns, in which capacity he embalmed Prince Rupert. In petitioning for a quarter's salary three years overdue, he stated that he had a great family and a sick wife. In July, 1689, Dr. Thomas Lawrence was gazetted Physician-General of the troops going to Ireland and Director of the hospital there, subsequently becoming P.M.O. in Flanders. He was Marlborough's Physician-General in the Blenheim campaign in 1704, a Physician to Queen Ann, by whom he was knighted, and died in 1714. In Scotland, Dr. Blackader, who had done political service for the King, was Chief Physician. Dr. David Mitchell was appointed Physician-General there in 1696. The Apothecary-General, Isaac Teale, succeeded Richard Whittle, the Apothecary of Charles the Second's Army. He served in Ireland and Flanders, was present at Blenheim, and died in 1710. Whatever this official's original duties may have included, he became in the eighteenth century a contractor for army drugs and dressings.²

The new King found himself engaged both in a war with France and in the reconquest of Ireland. Ten battalions were at once despatched to join his allies in the Low Countries, and several new regiments, hurriedly raised, were landed in Ireland with a Dutch brigade under the veteran Duke of Schomberg, who had been the finest soldier of his day.

Considering the conditions of service, it is not surprising that recruiting was difficult. The matter was one for the company commanders who were driven to seek the aid of crimps, some of whom were from time to time accused of actual kidnapping. In 1694 debtors were released from prison on undertaking military service or finding a substitute. In 1703 persons without visible means of support were impressed and criminals from gaol were accepted. In the eighteenth century the indiscriminate grant of commissions to persons who could collect the

¹ Commons Journals, January 27, 1689.

² The contract was not always a good business proposition. Dr. Coatsworth, Teale's successor in 1715, claimed a debt from the Treasury of £15,283 three years overdue, stating that the utmost he could do was to stave off for fourteen days the shame and disgrace of being publicly affronted by his creditors in the streets. His widow recovered part of the claim.

appropriate number of men brought numbers of undesirables, both officers and other ranks, into the Army. Meanwhile officers from the leisured class were not wanting, many of whom recognized no further obligation than to behave creditably in action, and made no effort to master the details of their profession.

When Schomberg landed, Ulster had already been won by the local loyalists. He advanced towards Dublin but the English troops were as yet quite unfitted to take the field. William Harbord, the Secretary of State at War, knew nothing of his business, and Shales, the Commissary-General, was a knave. The transport horses were still in Cheshire where they had been leased to farmers, the rations were uneatable, and the beer impossible, the last a much more serious matter than at the present day. Clothing was shoddy, boots deficient, tents rotten, and medical stores and personnel short. Even the muskets came to pieces in the men's hands. Schomberg, therefore, dug himself in at Dundalk and refused an engagement.

The bogs of Ireland, at any rate at that period, were not regarded as a winter health resort; but the tragedy which ensued was mainly the result of ignorance and indifference to the men's welfare shown by the officers, the bad discipline and morale of the men themselves induced by the shameful neglect to supply proper pay, food, or clothing, and the absence of elementary sanitary precautions. The Dutch officers cared for their men like fathers, saw that they paved their huts and bedded them with clean fern. Sickness in their ranks was negligible. The English infantry died by hundreds from some form of pestilence, presumably typhus. An anonymous letter from Dundalk printed in the *Calendars of State Papers* says: "We left above 10,000 men not slain, but merely interred in the fields, then with a poor sickly Army retreated back to the North to fight with hunger and cold which had already reduced some regiments to 100, others to 50." Macaulay, quoting a contemporary writer, adds "Many were sent by the English vessels which lay off the coast to Belfast where a great hospital had been prepared, but scarce half of them lived to the end of the voyage. More than one ship lay long in the Bay of Carrickfergus heaped with carcasses and exhaling the stench of death without a living soul on board."

In July, 1689, de Boussière was gazetted "Surgeon-General to attend His Majesty's Forces" and received a good confidential from Schomberg in March following, when he was referred to as the surgeon at Carlingford. At the same time one surgeon, Thompson, was damned. The correspondent above mentioned refers to Mr. Charles Thompson, possibly not the same, and Dr. Dunn as "men of honesty and worth to whom the Army was much indebted."

King William, with a well equipped army of various nationalities,

about half of them British, commanded in person in 1690. The victory of the Boyne in July was followed by the occupation of Dublin. In spite of improved arrangements, the threat of a further epidemic caused the abandonment of the siege of Limerick, and an independent force under Marlborough, which took Cork and Kinsale, had to curtail its operations in the autumn owing to sickness. Charles Thompson, who now appears as "Surgeon-General in Ireland," wrote from Cork on November 17, 1690, to the Secretary to the Lord Justices that having just arrived he found the three hospitals there in a miserable and scandalous condition. The sick soldiers chose rather to die than go to them, were infecting the town, and begging in the streets. There was no food provided for them and no nurses. He asked for the latter to be authorized at the rate of one per sixteen patients, demanded equipment from the Mayor at the town's expense, and secured on his own responsibility a subsistence allowance at the rate of 3d. a day.¹ By this time the King had gone home to prepare for his campaign in Flanders and the final subjugation of Ireland was left to Count Ginkel the following year.

As a result of bitter experience, the administrative services in Ireland in 1691 seem to have functioned satisfactorily. The King had been accompanied by his physician, Dr. John Hutton², whom in October, 1691, he appointed "sole Physician-General of his Armies and Hospitals." Meanwhile he was associated with Van Loen, the Surgeon-General, in the re-organization of the Medical Services. Dr. Lawrence appears later as Physician-General in Flanders.

In November, 1690, orders had been given to establish fixed hospitals at the Royal Hospital, Kilmainham, in Dublin, and at Waterford. The first aid and marching hospitals instituted during the campaign of the previous year "having not answered their purpose," were to be discontinued. Colonel Venner, of the 24th regiment, who had been appointed Governor of Kilmainham, drew up a scheme which received royal approval in April. There was to be a chief hospital and medical store depot at Kilmainham, a new marching hospital, and a third "to be erected in the best convenient town nearest to the place of action." For these were provided 3 physicians, 3 master surgeons and a surgeon general, 15 surgeons' mates, 3 master apothecaries, 6 apothecaries mates, a butler and his assistant for Kilmainham, and purveyors for the other two, 3 clerks.

¹ Thompson held his appointment till January 1, 1691, for which he received £456 13s. arrears of pay in December, 1692 [Calendars of Treasury Books, 19.12.1692].

² John Hutton, a herd boy of Caerlaverock, Dumfries, was educated at the expense of the minister of the parish. He was M.D. Padua and F.R.C.P. London, 1690. He owed his appointment as Royal Physician to having been at hand when the future Queen Mary fell off her horse in Holland. He died Member for Dumfriesshire 1712 [D.N.B.]

3 cooks and assistants, 40 nurses (half to be at the chief hospital), 15 washers. The marching hospital was to have a butcher. The orders for the marching hospital were:—

(1) Tents to be 20 feet long, $10\frac{1}{2}$ feet high and $8\frac{1}{2}$ feet broad, 4 beds to each tent, each 4 feet wide or a little over, so as to hold 2 sick or wounded. There are to be 25 tents lined with condemned canvas, to be made so that at the end they may be joined together and that there may be a tent pole to every tenth foot, so that in every tent may lie 200 men.

(2) Twenty-five servants may be allowed instead of so many women as nurses who can help to put up the tents and bring wood, water, and other necessities, and there are to be 10 women as washers.

(3) There are to be 12 cars with small horses to carry tents, to be made so that they can carry off the sick to any fixed hospital. The servants may be drivers, which will save the King the charge of 2 wagons.

(4) The 25 servants may have firelocks to serve as a guard.

(5) There are to be 8 wagons, 4 horsed for medicine, bedding, etc. Two conductors to command the 25 men and the carters. The 25 men to have 1s. 6d. per diem. Waggoners to have 8 boys as assistants.

Efforts were now made to improve both the quantity and the quality of the medical staff. Count de Solmes had reported in the winter that officers of the hospital should be sent over at once; the sooner they arrived the sooner would their lack of experience be remedied. He said that the state of the hospitals had accounted for many deaths. Those in charge passed for doctors, but were not so. As a result of this, Dr. Hutton was sent round to investigate their qualifications.

The colonels of all regiments were ordered by Ginkel to see that they secured able surgeons. To encourage medical men to come forward they were to be allowed their full pay when due, in place of the usual mode of payment by subsistence and arrears.¹

At the outset, drugs, bedding and utensils for the hospitals had been provided by contracts entered into by the four censors of the Royal College of Physicians of London. The latter were paid two sums of £1,417 and £1,952 in 1689 on this account. Experience showed that local purchase was much more economical. In March, 1692-93, the money for medicines was paid to Isaac Teale, the Apothecary-General.

In Flanders, as in Ireland, we seem to have passed from initial chaos through painful stages to something like administrative efficiency. The British regiments sent, though they behaved well in the face of the enemy, were reported by the Prince of Waldeck as under strength, the officers

¹ The pay of a surgeon of horse in Ireland was 6s. a day, of an infantry surgeon 4s., mate 2s. 6d.

ill-paid and several ill-conducted, the men sickly and undisciplined, clothing and food bad, and arms defective. The only reference to the early medical arrangements in the Calendars of State Papers is a report made in December, 1690, that "the medicine has arrived and is worthless. It will rather kill those it is meant to cure than cure them. The Master of the Hospital is incapable; want is everywhere apparent; more clergy are needed to minister to the wants of the sick." But in 1691 the King, having done with Ireland, took over 23,000 men, and things began to wake up.

The war was one of sieges and manœuvres in which King William usually came off second best. The two great battles of Steenkirk (1692) and Landen (1693), though French victories, greatly enhanced the reputation of the British infantry on whom the brunt fell. The siege and recapture of Namur in July, 1695, was the only important success of the Allies. This battle honour is borne on the colours of thirteen existing infantry regiments, and the Royal Irish disbanded in 1922. In the autumn of each year both sides went into winter quarters, preferably in each other's territory, and most of the officers went home on leave or to beat up recruits.

Medical details are scanty. Hospitals were sited in certain towns to which the sick and wounded were evacuated either in the bread wagons or by water transport. There seems no mention of a marching hospital; perhaps owing to the number of towns and villages in the theatre of war it was considered unnecessary. Prisoners, wounded or otherwise, were constantly exchanged under local arrangements. Corporal Trim, in "Tristram Shandy," described how when wounded and left on the field of Landen, he lay for some twenty-four hours before he could be exchanged and removed with thirteen or fourteen others in a cart to our own hospital. After Steenkirk our own surgeons were allowed to go over to the French camp to attend to the British prisoners.

The establishment for the Flanders hospitals in 1693 comprised a governor, 3 assistants or controllers, 4 physicians, 4 surgeons, 18 surgeons' mates, 3 master apothecaries, 5 apothecaries' mates, 3 chaplains, and 4 clerks, suggesting that there were three hospitals. Patrick Lambe, the victualling contractor, provided three butlers and their assistants, and a sufficiency of washers. Though nurses are not specifically mentioned, he stated, in petitioning for better terms owing to the expense of local labour, that the supply of nurses cost him 1,500 sterling a year. A pass was issued in April, 1696, to Joan Hedley, a nurse to the Flanders hospitals, and among those returning at the end of the war were Elizabeth Grey, Mary Harvey and Petronell Porter, possibly the three chief nurses sent out to supervise the locally hired staff. Colonel Venner was brought over from Ireland as the governor of all the hospitals. In 1697 Mr. John

Hudson, as mentioned as a director of the hospitals in Flanders. He subsequently held this appointment in Marlborough's campaign.¹

In the winter of 1691-92 a new contract for drugs had been made with Jonathan Leigh, Robert Gower, Edward Harle and James Anderson, apothecaries, as a result of which Sir Christopher Wren was instructed to view three rooms in the Savoy adjacent to the Thames, two of which were in possession of Mr. Allen, the messenger, and the third used for keeping Irish prisoners, and to cause them to be fitted up at the King's charge. In 1692 a bill was passed for medicines supplied from the Elaboratory at the Savoy. It had been certified by the three Counsellors for Medicine, Dr. John Hutton, Sir Thomas Millington and Dr. Thomas Lawrence.

No attempt will here be made to follow the progress of the successive campaigns fought out in the quadrilateral Antwerp-Dunkirk-Namur-Maestricht during these nine years. Steenkirk (July, 1692) cost the Allies 3,000 killed, 3,000 wounded, and 1,300 prisoners; Landen (July 19, 1693) 12,000 casualties, and Namur (June 26, 1695) perhaps another 3,000. The fighting in these battles seems to have been literally hand to hand. In 1697 both sides were sufficiently exhausted to agree to the Peace of Ryswick, following which there was an immediate demand for Army reduction. Numbers of regiments were disbanded, the English establishment was cut down to 7,000, leaving 12,000 men in Ireland. The surplus officers went on half pay. Vast sums meanwhile were owing as arrears of pay as well as to contractors, and great hardship resulted. We learn from the victualling agents' bill that at the time of the peace there were hospitals at Brussels and Breda, and the mention of one at Tilbury suggests it may have been formed to receive the invalids transferred.

However barren the results, the campaign established the fighting capacity of the British Army as equal to the best in Europe. Fortunately one was at hand to absorb the administrative lessons of the Irish and Continental wars. In the campaign which was to follow the genius of Marlborough was displayed no less in the ordering of his ancillary services than in his tactics in the field.

Three other theatres of war must be mentioned. A surprise attack on Brest in June, 1694, which, owing to the secret having been betrayed, ended disastrously on the beach. Mackay's suppression of Dundee's rebellion in Scotland in 1688-89, chiefly remembered for the rout of the regular troops, less the Somerset Light Infantry, in the pass of Killiecrankie; and the Cameronians' baptism of fire at Dunkeld.

¹ The Director of Hospitals was concerned with the contracts for hospital building and supplies, and as such had no direct authority over the medical staff. In later years the appointment was sometimes held by the Physician or Surgeon General of the Expeditionary Force.

Early in 1692 preparations began for the despatch of a squadron under Sir Francis Wheeler to the West Indies, where our colonists were in sore need of protection from the French, and Faulke's and Goodwyn's Foot were ordered to be embarked with twelve women per company. On the recommendation of the Royal College of Physicians, Dr. William Grimbaldson was appointed Physician-General with the salary of £500 per annum. The apothecaries were James Hayes (£100) and Robert Kenton (£60). After a year's delay the force sailed on January 9, 1693, arriving at Barbados in the rainy season when it began to go down with fever. Some 2,300 men, including the local militia, and 1,300 seamen invested S. Pierre, but owing to continuous sickness and the doubtful behaviour of the Irish troops, the enterprise was abandoned. In the Navy 25 officers, including 8 surgeons and 4 chaplains, died, and 650 other ratings. The two regiments lost their colonels and 24 other officers. The appointment of Dr. William Fleming as Physician-General to a force for Jamaica in October, 1694, is also recorded. The operations, partly owing to sickness acquired on the outward voyage, were no more successful.

The following names of regimental surgeons are found in Dalton's *English Army Lists and Commission Registers* and the *Calendars of State Papers*. The starred regiments bear the battle honour "Namur 1695." Several other regiments, not included, were disbanded in 1697.

CAVALRY.

LIFE GUARDS: 1st troop, John Brown 1689, serving 1715. 2nd, Anthony Rousseau in 1691. Gabriel Jones¹ 1691. R. HORSE GUARDS: Thomas Sisum in 1685. Paul Margrett² 1690, serving 1715. 1ST DRAGOON GUARDS: Alexander Hubin in 1685. QUEEN'S BAYS: Thorowgood Meautys in 1685. Latimer Ridley 1689. Hannibal Hall 1698. 3RD DRAGOON GUARDS: Thomas Deane in 1685. Bartholomew Harris in 1691. Archibald Blair 1692. 4TH DRAGOON GUARDS: Anthony Rousseau in 1685. Frederick Swarth 1696. James Hamilton 1702. 5TH DRAGOON GUARDS: James Pringle³ 1687. John Edwards 1694. Daniel Cabrole 1700, at Blenheim 1704. CARABINIERS: George Bellamy⁴ in 1687. William Bell 1692. William Stone 1702, at Blenheim. 1ST R. DRAGOONS: Thomas Robson in 1687. Owen Bennett 1693. John Brown 1696. R. SCOTS GREYS: Patrick Ainger 1687. James Nisbet,⁵ commission renewed 1703, at Blenheim. 3RD HUSSARS (Dg): Noe L'Esveque in 1685-87. 4TH HUSSARS (Dg): John Olivier in 1685-87. John Duclos 1692, serving 1702. 5TH LANCERS (Dg): William Cocksedge in 1694, at Blenheim, cornet 1705. 6TH DRAGOONS: John Thompson in 1689. 7TH HUSSARS (Dg): George Preston 1691. Peter Telfer in 1695. 8TH HUSSARS (Dg): John Stewart in 1702.

INFANTRY.

*GRENADIER GUARDS: John Noades in 1685-90. Archdale Harris 1690, at Blenheim. *COLDSTREAM GUARDS: Charles Dakins in 1690-1702. *SCOTS GUARDS: John Baillie 1684.⁶ Francis Oliphant⁷ 1689. Robert Campbell 1696.

*ROYAL SCOTS: Peter Boullay 1688, at Blenheim. *QUEEN'S: James Wylley¹ in 1684-88. Henry Harris 1696. John Dalrymple 1669.² *BUFFS: James Peirse in 1684-87. John Smallbones³ 1688, at Blenheim. Alexander Arthur,¹⁰ mate 1694. *KING'S OWN: Henry Musto⁴ in 1684-87. Estienne Roussell, Dec. 1690. John Wilson, Mar. 1695. NORTHUMB. FUSILIERS: John Heath 1699. *R. WARWICK: Bernard Delpash¹¹ 1700. ROYAL FUSILIERS: Andrew Heriot in 1685-87. Hannibal Hall¹² 1694. Hosea Figuel 1696. James Smith 1700. KING'S: Charles Dakins in 1687. Alvery Dodsley 1694. James Chambers 1696, at Blenheim. R. NORFOLK: William Thomas in 1687. LINCOLN: James Young in 1687. Daniel Debeeze 1694, serving 1715, at Blenheim 1704. DEVON: Philip Rose in 1687. John Heathfield 1702. R. SUFFOLK: John Rosse in 1687. Thomas Bald in 1696. SOMERSET L.I.: Claude Gillart in 1687. Duncan Campbell 1695. *WEST YORKS: John Ridley in 1687. William Govan,¹³ July 5, 1695. Richmond Webb 1699. EAST YORKS: Thomas Baker in 1687. Peter Cockburn 1694. Francis de Faure 1700, at Blenheim. *BEDFORD: John Mouat 1688. George Rolf 1694. John Whitfield 1697, killed at Blenheim. *LEICESTER: John Blean in 1688. *[R. IRISH]: Robert Weldon (from mate in the Guards) 1689, at Blenheim. GREEN HOWARDS: Theophilus Allen in 1689. Benjamin Malfaquerat 1694. LANCASHIRE FUSILIERS: John Hamilton in 1689. R. SCOTS FUSILIERS: William Borthwick¹⁴ in 1686-88. Frederick Segervis 1694. Alexander Renton 1702, at Blenheim. CHESHIRE: Walter Tooke 1689. — Monro 1695. *R. WELCH FUSILIERS: John Knibloe 1692. Henry Roust¹⁵ 1695. Daniel Cabrole 1696. John Young 1699, at Blenheim. S. WALES BORDERERS: Gerald Lisle in 1689. Peter Carnac 1699, at Blenheim. *K.O. SCOTTISH BORDERERS: James Sterling 1694, serving 1702. CAMERONIANS: Gideon Elliot 1689. George Hay 1691. Peter Grinsell 1692. John Weams 1694. R. INSKILLING FUSILIERS: William Cormack 1693. WORCESTER: Abraham Silk 1694. GLOUCESTER: Robert Hart 1694. E. LANCASHIRE: Isaac Toussain 1696. *[LAUDER'S FOOT]: William Gledstones 1694. *[BUCHAN'S FOOT]: Homer Grierson 1694. *[MACKAY'S FOOT]: Peter Chapuzette 1697 (killed in action 1708).

NOTES.

¹ *Gabriel Jones*. Drowned at sea 1697. Widow £20 pension. [Dalton.]

² *Paul Margrett*. He was mustered as mate 1st Guards January, 1698, having been surgeon to Hale's Foot 1688.

³ *James Pringle*. He succeeded James Arden. Commissioned in Wauchope's in Scotland 1689.

⁴ "James Pearse, surgeon, recommends recognition of Mr. Hobbs, who attended the General and the Horse Guards in the late rebellion in the West, *Henry Musto* and *James Wylley*, surgeons to Lord Trelawney and Col. Kirke, who dressed wounded sent to Bridgwater (110) up to the end of September, and *George Bellamy* who looked after 38 wounded sent to Bath" [Treasury Books 1685-86]. Battle of Sedgemoor 1685.

⁵ *James Nisbet* was surgeon to Lord Glencairn's regiment in 1689 [Register Scots Privy Council].

⁶ *John Baillie* served with the Scots Guards in Mackay's campaign 1689 [Scots Treasury Register].

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⁷ *Francis Oliphant*. Perhaps the Dr. Oliphant on the hospital staff at Blenheim graded as a physician.

⁸ *John Dalrymple* was appointed surgeon to Cutt's regiment January 9, 1693. A prisoner of war at Almanza 1707.

⁹ *John Smallbones* was physician to Argyll in Spain 1711.

¹⁰ *Alexander Arthur* was surgeon to the Cameronians at Blenheim 1704.

¹¹ *Bernard Delpash* was wounded and a prisoner at Almanza 1707.

¹² *Hannibal Hall* appointed surgeon Venner's Foot in 1692. To 2nd DG. 1698.

¹³ *William Govan's* commission was signed on the field at Namur July 5, 1695.

¹⁴ *William Borthwick* served with the R.S.F. in Mackay's campaign [Scots Treasury Register 1688]. Chirurgeon Burgess of Edinburgh, son of William Borthwick designed of Maysheill and Pilmore [Dalton, Scots Army].

¹⁵ *Henry Roust*. Commission signed at Namur July 20, 1695.

The passes granted to and from Flanders (Calendars of State Papers Domestic 1696-97) give the names of some of the hospital staff not found in Dalton's lists. Some of those describing themselves as surgeons were quite possibly officially graded as mates or apothecaries.

Mr. John Hudson,¹ *director of hospitals*; Jas. Dayrolle, *controller*; Mr. Herbert Price, *clerk*.

Dr. Thomas Lawrence,¹ *physician-general*; Daniel Morel, Robert Ley,² John Lecaen³ (1694), *physicians*. A Dr. Peter Bellon died at Ghent 1696 of "Spotted Fever."

James Chambers, John Fairley, James Craford, George Dundas, William Deas, Thomas Wilson,⁴ Levi Ball, Samuel Camlin, Alexander Garshore, John Kirkwood, George Ramsay, Samuel Westwood, Patrick Cumming, John Moorhead, Patrick Michel, George Pringle,⁵ William Wallace, Thomas Fruen, Cornelius Vandyke, *surgeons*.

Isaac Teale,¹ *apothecary-general*; Peter Chambron, Peter Canolle, George Marriott, William Thornborough, Charles Bland, *apothecaries*; William Morris,³ Henry Hamilton, John Randall, Peter Everbrook, James Anderson, John Pewney, John Buckley, *apothecary's mates*.

George Lauder and Mr. Martin, *chaplains*.

Elizabeth Grey, Mary Harvey, Petronell Porter, Joan Hedley, *nurses*.

NOTES.

¹ *Lawrence* and *Teale* served Marlborough in the same appointments.

² *Robert Ley*. A surgeon of this name is on the hospital staff of Dalton's Blenheim Roll.

³ *John Lecaen* and *William Morris* served also in Ireland, when *Morris* was a Master Apothecary.

⁴ *Thomas Wilson* was a staff surgeon at Blenheim. He died of "barbarous usage by the enemy" in 1711 [Treasury Papers, exciv, 65]. His widow, who received a pension of £30 a year, stated he was a physician and his pay £1 a day.

⁵ *George Pringle* was a surgeon's mate in Ireland. Surgeon 2 DG. 1708.

THE LOG OF THE "SEABIRD" OSPREY.

BY MAJOR E. F. W. MACKENZIE, O.B.E., M.C.

*Royal Army Medical Corps.**(Continued from p. 330).*

Dec. 21.—Last night was quite chilly, and after waking at 2 a.m. to put on another blanket I got up again at 4 a.m. and found a strong breeze coming from the land.

I at once lit the stove, had breakfast and packed up, getting away before a good breeze at 5.45. Although the wind was off-shore, quite a loup got up in the two or three miles, and with the tops coming off the waves we were soon soaked and very cold. It was strange, in the darkness, to see the spots of phosphorescence scattered all over the lower half of the sail and looking for all the world like glow worms. At 7.10 we were due west of Ratnagiri light making 7 miles in 1 hour 25 minutes with one reef. At sunrise the breeze fell a little and the warmth was very cheering to me, and also no doubt to my tindal. By 7.30 it fell dead calm, and though puffs came occasionally from the SE. it has remained so until 10.30 a.m.

Later.—The sea breeze came at 10.30, at first light from north, so I stood out to sea on the starboard tack to get an offing, and going about when the breeze backed to north-east. I just made Jaigarh close hauled on the port tack for 15 miles. Besides the light shown on the chart on Jaigarh head there is a red light on the Fort and a red light off the custom house at Jaigarh, so there should be no difficulty entering at night. I first made fast to a mooring which the customs wallah told me to use and at which I found, when sounding, there would be one foot at low water, mud and rock bottom. There is, however, good anchorage in 3 to 4 fathoms at about $\frac{1}{2}$ to 1 cable all along the left or west bank. Shortly after I arrived the ebb began, and with the strongish westerly breeze coming straight into the bay a nasty sea got up over the bar and inside the harbour, which is completely landlocked; there was a 3 or 4 foot swell. This caused me considerable entertainment when I went off in the custom's boat to the s.s. "Lilavati" and secured two loaves of crisp fresh bread, a welcome addition to my stores. A horde of deck passengers arrived in the bumboat which, when alongside, heaved up and down on the swell. Men, women children, infants in arms and luggage of all sizes and descriptions were hurled aboard in a heterogenous mass amidst such a shouting and screaming as can be heard only amongst the people of the East. Then the performance was reversed and a similar mass issued from the ship, which each time the boat rose on a swell vomited forth another group. These

sat or lay exactly where they landed, and so received the next lot on top of them.

Meanwhile boxes, bags, bundles and children were hauled indiscriminately from the ship's rail into the bows of the boat until one felt they must be falling out through her bottom, so many did there appear to be. On making inquiries at the customs I was relieved to find that the loss of life on these occasions is not so heavy as one would expect!

Apart from bread from the ship the only supplies to be had are eggs, soda water and water—the latter from a well up in the fort, since one of the custom house wells was dry and the other gave only salt water. The fort is about ten minutes walk up a hill by way of some steep steps and both it and the view from the top are worth the climb. The village, too, is picturesque and the hills behind it are well wooded in contrast to most of the coast from Malwan northwards, which is composed of sheer cliffs broken only occasionally by small beaches backed by low brown hills almost bare of vegetation of any sort. It is not in any way to be compared with the coastline south of Goa from the point of view of beauty, though the harbours are good and well sheltered for small craft.

The river here is navigable for over 20 miles but it appears to run through bare uninteresting hills and I think I shall go on to Port Dabhol where I expect to pick up a mail.

Dec. 22.—This morning I got up at five as I hoped to do the day's run of about 20 miles on the morning breeze and have the rest of the day to explore Port Dabhol.

I was doomed to disappointment as the morning breeze did not materialize, so I got my anchor at 8 a.m. and drifted out on the ebb with just enough light airs to keep steering way. Last night I had noticed "Albatross," one of the luxurious country-rigged three masted schooners which some of the fortunate officials of the Salt and Excise have as homes, in port—owner not aboard—and she followed me out, though I arrived some three hours ahead of her at Dabhol.

There was no sign of the land breeze until 10 a.m. when a light breeze took me to Boria Pagoda. The sea breeze came from due west and I had a nice reach to Talkeshwar point and a run up river to Dabhol, dropping my anchor in the little bay east of the jetty at 2.15 p.m.

After tidying up ship and myself, cleaning lamps, primus, etc., I went ashore and saw the customs official, who filled up my water, secured eggs and was even more helpful than these officials have been elsewhere. In the evening I caught some small fish from "Osprey" which were excellent eating.

The customs official tells me the river is deep water without obstructions as far as Karambarna over 20 miles from the entrance, so I intend to explore it to-morrow, spending the night there.

Dec. 23.—As I was not sailing this morning the land breeze came early

and good, waking me at 4 a.m. and causing me to wrap up more warmly. It is getting distinctly chilly in the early morning and to-day I cooked my breakfast well wrapped up. I went ashore at 8 a.m. and, after posting some Christmas cards at the local Post Office, I was shown round the village by my helpful official, who is an extremely well educated man and who, unlike any other Indian official I have come in contact with during this cruise, has an excellent knowledge of history of India, and of the historical associations of places of interest in the locality. He informed me that there was no industry and that the population existed principally on account of the toddy production. As this is all consumed locally it seemed to me very like the community all of whom lived by doing washing for others. Certainly the toddy-wallahs seemed to live in the most prosperous-looking and best constructed houses. The village is picturesque and planted amongst thick groves of cocoanut and betel palms, the cultivation of which is carried out with great zeal. Walking through the village in the pleasant shade of the palms and the cool of the early morning I heard a musical sound which at first I took to be the notes of a large organ some distance off. Gradually one note detached itself and was recognized as being nearer and less musical than when blended with the other in a rising and falling harmonious sound. On investigation the noises were found to proceed from innumerable Persian wheels, usually in pairs, each pair producing a very considerable stream of good clear water for the irrigation of the palms. As usual the old buffaloes were wandering round and round quite unattended and appearing as though they had obediently come out at dawn and yoked themselves to their wheels.

There is one building of real interest, a large mosque with a great dome which was built, I was informed, by Akbar during the Mogul dominion over the Mahrattas. It is in excellent repair and has much handsome stone carving. Close to it is another excellent building, part of which has become ruined and which served as a rest house when Dabhol was a pilgrimage port of considerable importance.

Having seen the sights, I caught two or three small fish from the pier, greatly to the edification of most of the inhabitants and just before the turn of the tide at 12.40 I got away on a beat up river for about 8 miles when the sea breeze came and I went bowling along with spinnaker set and a good tide under me. The river is from a quarter to half a mile wide with deep water almost to the banks from which steep hills rise making the winds uncertain in some of the reaches. The scenery is generally pretty, the steep brown hills dotted with green trees are frequently interrupted by deep valleys which are thickly wooded and down which tributary streams flow during the rains. There is little traffic and few sails on the water as the country boats have been largely displaced by steam launches which ply daily from Port Dabhol. Fortunately they are few in number, for their passing is the only unpleasant episode in otherwise delightful surroundings.

Passing up the river I witnessed a method of fishing I have not seen

before and which causes the onlooker considerable amusement. It requires about five to seven men, two of whom, standing in the water up to their shoulders, move slowly up stream carrying a large square net slung between two bamboos. The remainder creep along the shore among the mangrove trees, shadowy naked figures flitting from tree to tree, and at the correct moment emerge in a line, advancing towards the net with much shouting and splashing, driving the fish before them. The net is then scooped upwards and the meagre catch of tiny fish shaken out into a basket.

As we neared the upper reaches of the river and rounded a bend a long straight stretch of water lay before us on either side of which spur after spur ran down to the water's edge. Through the wide gap of the valley, outlined in deepest blue against the pink light from the eastern sky, appeared the Ghats.

We were nearing the end of our journey, but when within a mile of our destination the breeze fell and we had to paddle there, dropping the anchor at 7.30 p.m., a short way up a large tributary which joins the Washisti on the right bank opposite Karambarna. Unlike the main river, this tributary has many wooded islands.

Dec. 24.—I awakened to a very cold and damp morning without a breath of wind and was finishing breakfast at dawn.

Before the sunrise a thin white veil of mist hung over the river and in the valleys. The reflections in the hills and reedy banks in the glassy surface of the water made a very beautiful scene.

As the light increased I was overjoyed to see large flocks of ducks along the bank on the other side of the river and getting the anchor up as rapidly as possible the tindal and I were soon paddling up and across the stream to drift down upon them on the ebb tide, which was then setting in. Great was my disappointment when, on getting nearer to them, I found that they were water hens. There were, however, a few duck further down and I shot three, picking up only two as the other fell among mangroves and I could not reach it in "Osprey." I have since plucked and singed them and they will make a very welcome change from chicken and tinned food.

Since I wanted it, there was no morning breeze to-day and we have drifted down stream on the ebb without keeping steering way until a few minutes before noon, when a good breeze came from the west, and we are now bowling along with spinnaker set.

The tide turned before we reached Dabhol and delayed us until 4 p.m., too late to be worth while starting for Harnai as I had intended to do. If there is any breeze I shall get away early in the morning and try to make Janjira.

I very much doubt if there is any place to compare with Port Dabhol for a week's cruise from Bombay. It is an excellent harbour, ships with supplies from Bombay call daily and the river is navigable at any tide and

without need of a pilot for 20 miles; at high tide and with a pilot with local knowledge, for many more. The night I spent there was only just inside the entrance to a large fresh water tributary and though I saw only a few duck it is probable that there would be many more further up, where a steam launch drawing 5 ft. goes daily at high tide. Moreover, in the middle of a cruise, a few days river sailing is very delightful and the fluky winds and puffs out of the valleys make it always interesting, especially taking a boat to windward.

Dec. 25.—I was awakened this morning at 2 a.m. by a good breeze from the east and got under way at once, leaving at 2.25. It is unusual to get the land breeze so early but I hoped that, as it was coming fresh and steady it would hold, at any rate until sunrise, when I would be some twenty miles on my way. Again I was doomed to disappointment for it fell light as I was making down harbour and has remained so until 7.20. However it was a delightful warm morning and the moon setting as we passed the heads, the stars showed up brightly, Orion crossing the heavens and the Southern Cross low down above the horizon. Moreover, with the breeze as it is at present, I should have taken a long time to get out against the flood.

11.30 a.m. : The breeze has remained light with calms and I have made only another $8\frac{1}{4}$ miles in over 4 hours, being 6 miles from Harnai which bears 97° .

1.30 p.m. : The sea breeze is coming from a few degrees N. of W.

I have had a spinner out again all the morning without touching a fish, although occasionally sailing at good fishing speed. The scarcity of fish is the most remarkable thing of the cruise. Last year travelling to Karwar the sea was at times almost alive with surmai, and at the rocks off Karwar one could be almost certain of raus and kokari, whereas this year even the fishermen had given it up. During the whole of my cruise I don't think I have seen a dozen game fish show up other than those I have hooked. I have not seen a single porpoise, whereas last year we passed through school after school of them and the only things that appear in every bay and harbour are the peculiar fish like dolphins, known locally as sea hogs, and which push out, first a long snout, then a large grunt and then a dorsal fin, occasionally throwing the flukes of their tail in the air and sounding like a whale.

A tragedy occurred yesterday evening which has a moral. After much cajolery and some bribery I secured a last loaf of good fresh bread. As I was going for a walk I sent it aboard.

My tindal was also on shore and when we arrived back the paper in which the bread had been wrapped was scattered in small pieces and the crows had consumed the greater portion of my new and only loaf. Biscuits are very dry things. I feel as disappointed as the down and out who spent his last penny on a bloater and when he came to eat it, found it had no roe.

Dec. 26.—After the last entry the sea breeze came light from the north backing as usual to west for half an hour and shifting again to north.

I had kept about 7 miles offing which allowed me to make only as far as Kandalu Point, close hauled on the port tack, arriving there at 7.10 p.m.

With the breeze now almost due north it was a dead beat across Kumbaru Bay and I intended then to stand out from Kumbaru Point on starboard tack and pass between Whale Reef and Rajpuri Point on the port tack.

As it fell almost dead calm when off Kumbaru Point I gave up and drifted into the bay SE. of that head where we anchored in 4 fathoms mud about two cables off the beach at 10.30 p.m. after a spell at the tiller of 20½ hours with much calm and having covered only 43 miles. There I now lie at 10.30 a.m. on a sea of glass waiting for a breeze. The bay gives good shelter from all northerly winds and is a very pleasant little cove with sandy beaches, steep cliffs and clear blue water for bathing. Of my anchorages, those I look back upon as the most delightful have all been small coves as distinct from the larger estuarial ports. In the former one is not surrounded by inquisitive natives who, further south where a yacht is rarely seen, look upon the arrival of one's ship as an astounding phenomenon and oneself as a sahib if anything more insane than usual; the water is clear blue and delightful for bathing; the beaches are of clean white or yellow sand instead of mangrove mud and last, but not least, one can cook and eat one's dinner and perform one's ablutions in comfort and privacy.

The two places that stand out as the most delightful are Colla Bay, south of the Marmagoa Headland, and Paos Bay south of Ratnagiri.

Later.—There was no sign of a land breeze. The first puffs of the sea breeze came at 12.30 and I got away at once. I beat up inside Shah Jehan Shoal and Whale Reef and crossing Janjira Roads met "Sheila," "Minx," "Bint" and "Isca" of the Royal Bombay Yacht Club all looking very fine bowling along before a light breeze with spinnakers set.

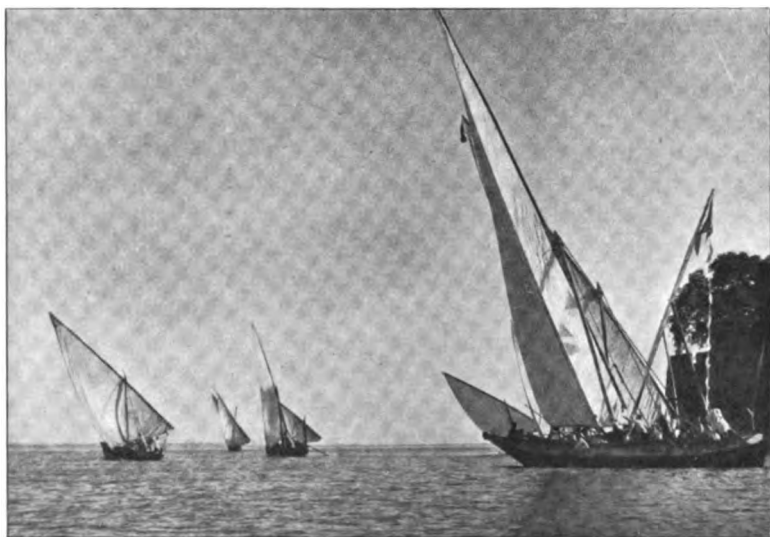
The breeze was well in the North and I had a long beat of 21 miles to Rewadanda where I arrived at 8 p.m. after another day of light breezes. There was a strong flood tide running and losing the breeze inside the entrance I very nearly got foul of a large cotton boat moored in mid-channel with no riding light. Later I found myself sweeping down upon fishing stakes which also run well out into the channel from the south bank, from a point about midway between Korlai Fort and Chaul Knob. I therefore dropped my anchor in 5 fathoms to wait for daylight.

Dec. 27.—As dawn came after a comfortable but cold night, I saw "Ranzo," Royal Bombay Yacht Club, anchored off the Custom House at Rewadunda and was soon beside her, going aboard for breakfast after my morning swim.

She left for Bombay shortly afterwards, accompanied by "Fiona" and "Giullemot" from up river, and later "Erin" dropped down under foresail and anchored beside me. We both intended waiting for the afternoon breeze

as we were going only as far as Kennery, so we went for a swim and explored the old Portuguese fort situated on the northern shore opposite the ruined Mabratta Fort on the headland on the other side of the entrance.

At 11.30 the land breeze which had held all the morning, was still blowing, so we decided to get out on the last of the ebb and get the first of the sea breeze. This worked out according to plan and after a nice beat in company as far as Alibagh outer reef buoy, easing sheets as the wind backed instead of northering as one expected it to do, we dropped anchor off the landing place at Kennery at 4.30 p.m.



Fishing boats at Kennery Island.

This anchorage is a poor one exposed to north and north-east but is quite comfortable at present. I found 3 fathoms mud about half a cable off the slipway.

After tea aboard "Erin" we went ashore and were shown over the lighthouse, the keeper very kindly explaining the mechanism to us. The island is well known to most Bombay yachtsmen and is well worth a visit if only to pick out from the top of the lighthouse the various landmarks of the harbour and down the coast.

I have just come aboard "Osprey" after a sumptuous repast on "Erin" and feel very sad at the thought that I am within sight of home and that my cruise will be ended to-morrow.

Dec. 28.—During the morning there was little breeze so we scrambled over the Island and the ruins of the fort which still contain some cannon mounted on iron carriages and with "V.R." embossed upon them. At 12.30 the sea breeze came light from the SW. and we picked up our moorings off the Yacht Club at 4 p.m. after an uneventful sail home.

When I started for home from Tadri River I left myself a few days in hand in case of accidents, but though breezes have been light since Paos Bay all has gone well, and I have made several short passages in order to see more places and not lose a day of my remaining leave.

It will be with very great regret that I unload my kit to-morrow and I do not think I have ever spent a more enjoyable six weeks or one more conducive to a healthy state of mind and body. On starting out I had been a little afraid of loneliness but never for a moment have I felt so. I do not think that one who loves a boat and the sea and the hills need have any fears on that score in tackling an even more extended cruise alone. The love of it all grows on one until, instead of being lonely, one begins to dread the inevitable return to one's ordinary life. Nevertheless it would be a very great mistake for one who does not love the sea for itself and in all its moods to undertake an extended cruise alone in a small boat, and probably a still greater mistake in company with anybody else. Alone he would have only himself to think of, or his tindal, which would lie less heavily on his conscience than having brought about an unfortunate accident to his best friend.

The total distance travelled from port to port by direct route was approximately 623 miles. The actual distance sailed was, of course, very much greater since head winds were frequent. To this should be added some 350 miles exploring creeks and rivers and day sailing from Karwar, a total of about 1,000 miles in forty-one days.

When making passages the average speed was three knots, a very fair average as many hours of calm were encountered.

The fastest passages were from Ratnagiri to Viziadrug at an average of 5 knots, and Machlimar Point to Aguada at $5\frac{1}{2}$ knots.

On the first of a good breeze I sometimes made faster going before the sea got up. This was chiefly with the wind slightly aft and the spinnaker set as a balloon jib rigged on a long bowsprit, which greatly increased my speed, especially in light breezes. The day I left Karwar I covered, across Sadashivgad Bay, eight miles in 75 minutes, partly with one reef down. Even then we were over canvassed and the boat was very wet and uncomfortable and we shipped a lot of water.

When blowing hard it paid every time to shorten canvas, since a "Seabird," if not sailed hard, is a very comfortable and dry boat for her size, but if over canvassed is very wet. I found a spray shield invaluable for keeping out the water when beating, and with this in view I had made my small awning of a suitable size to use also for this purpose. The fore end was lashed to the mast and the after end was led round the coaming on the weather side and lashed to the weather runner.

NOTES ON FITTING OUT.

Hatches were a necessity for comfort in sleeping and to provide sufficient deck space after stowing kit.

Water was carried in two petrol tins with one dozen vermouth bottles as

a reserve stored in the bilge. It was soon found that the petrol tins rusted and tea made with the water turned black. The bottles were then used for tea and water from the tins for washing.

The breaker was used by the tindal. It had a small hole and in a rough sea it was impossible to pour out water without spilling most of it in the bilge. It should have had a square hole large enough to put a mug in and a wooden stopper.

Paraffin for lamps and primus was carried in a one gallon mobiloil can which was excellent for the purpose.

The primus outfit was procured for me by Mr. St. Paul, of the R.B.Y.C., and consisted of a metal box holding one primus with wind shield (which is most necessary), two triangular tin containers for paraffin which slid into straps soldered across two of the corners of the box, a brass spirit flask with nozzle for filling the pan, and a copper filler with gauze strainer. The paraffin containers did away with the necessity for digging out the reserve store daily, and held enough to keep lamps and primus going for four or five days.

This whole outfit was excellent and did away with much of the unpleasantness of filling lamps and primus.

On the outward voyage a heavy awning was carried, but was never used and was sent home by steamer.

In its place a large light sheet of canvas was thrown over the boom. This gave shelter when at anchor and kept off night dew.

A green canvas "flea bag," two blankets and pillows were used for sleeping, and when rolled up tightly could just be passed through the hatch into the after locker. The boat's cushions which were flat were used as a mattress.

A large strip of mackintosh cloth made the following :—

A bag for the frying pan resembling a tennis racket bag. A strip for standing pots, dirty plates, etc., on and so avoiding staining the boat. A cover for the box containing the stores actually in use, which were kept under the starboard thwart aft and would otherwise have got wet.

At first potatoes, bread and vegetables were kept in airtight tins and went mouldy in two or three days. Afterwards they were kept in open tins. The potatoes and vegetables were thoroughly dried in the sun each day and kept for weeks.

For the boat the following spares were carried : Second anchor, spare tiller, several shackles of various sizes, a length of plough steel rope, lengths of Italian hemp rope of various sizes, a few yards of canvas for patching sails.

Sail needles, thimble and thread were frequently in use.

An assortment of spare deck fastenings, such as cleats, hardwood fair-leads, etc., would have been useful, as several of these broke or came adrift and makeshifts had to be improvised.

The following articles were used for navigating :—

The West Coast of India Pilot ; coastal charts, dividers, parallel rulers, lead pencils, eraser.

A luminous prismatic compass was extremely useful and was not appreciably deviated by the centreboard. When used to steer a course by it responded immediately and without swing. After some practice accurate bearings could be taken even in a rough sea. The setting vane over the luminous dial made it easy to set and hold a course at night.

Good Crook's glasses were found essential to prevent eye-strain, and a spare pair should be available as a replacement.

Personal clothing throughout the day consisted of shorts, glasses, and an old well-ventilated felt hat when wet, or a light pith helmet when dry. When becalmed at sea during the heat of the day it was quite impossible to keep cool with any clothing above the waist. Even a light tennis shirt became oppressive in a few minutes.

For shorts only to be worn without disaster, it is, of course, necessary to be well tanned before setting out.

When becalmed it was a simple matter to drop over the side for a swim and return to the boat completely refreshed.

At night at sea, grey flannels, shirt, sweater and yachting coat were welcome, particularly towards the end of the cruise when nights became colder and two blankets were all too few to sleep under.



Editorials.

THE PREVENTION OF MALARIA IN THE FIELD BY THE USE OF QUININE AND ATEBRIN.

At the invitation of the Malaria Commission of the League of Nations Health Organization, the Malaria Research and Entomological Divisions of the Institute for Medical Research, Federated Malay States, carried out experiments on the prevention of malaria by the use of quinine and atabrin. The experiments were made in accordance with a scheme laid down by the Commission for experiments in Europe from which it was hoped to supplement existing knowledge of quinine and atabrin prophylaxis, and particularly of the safety and efficiency of these drugs when administered in regular doses over long periods for the purpose of clinical prophylaxis.

The experiments were made in the State of Selangor, one of the Federated Malay States, during the period August, 1935, to October, 1936.

It was thought the population to be studied should be : Large enough to obviate gross anomaly from irregular sampling ; so closely grouped that the drugs could be regularly given by the staff ; under control so that regular examinations would present no difficulty ; and should have a high malaria morbidity.

Plantation malaria was considered most suitable for the experiments, as it fulfilled all the suggested requirements. Two plantations were chosen : a tea plantation with intense endemic malaria where there was no mosquito control, and a rubber plantation on which the anti-larva measures in force were only partially effective and malaria of mild endemicity had been a problem for years.

The labourers employed on the plantations were immigrants from Southern India ; some had lived in the Malay States for a number of years and had acquired such a tolerance for the local strains of the malaria parasite that attacks meant only a few grains of quinine and a day's rest ; many had recently arrived from India and had little or no immunity towards the local parasite.

The entire labour population of the two estates was divided into three groups selected only to ensure an even distribution of children and adults. The three groups on each estate were entirely comparable.

To one group on each estate 0.2 gramme of atabrin was given weekly on two successive days : the children received a dose proportionate to age. To a second group on each estate 0.4 gramme of quinine hydrochloride was given daily. The dose for children was proportionate to age ; children of 4 years and under were given chocolate tablets containing 0.1 gramme of aristoquine (di-quinine ethyl carbonate) ; this is an insoluble salt of quinine

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and is tasteless. To the third group on each estate, two tablets of an inert substance dyed to resemble atebrin in appearance were given. These groups served as controls. The inert tablets were given for psychological reasons.

If malaria attacks occurred they were treated in the atebrin group with 0.3 gramme of atebrin daily for seven days, in the quinine group with 1 gramme daily of quinine for seven days. The dosage for children was proportionate for age. Routine spleen and parasite surveys, at which every available member of the population was examined, were made at intervals of six weeks. Microscopic examination of the blood was made with thick films.

Regular catches of mosquitoes in a human-bait mosquito trap were made over a period of one week or more each month. Larval surveys were made at intervals of from four to eight weeks.

The human-bait trap consists of a large mosquito net with a door at one side which can be rolled up. A small net inside this surrounds a camp bed on which lies the man who works the trap and serves as a bait for mosquitoes. The trap is set at 6.30 p.m., the door being left open: at intervals of two hours from 8 p.m. to 6 a.m. the trapper closes the door of the big net and catches all the mosquitoes thus entrapped, opening the door again after he has finished.

The two estates were relatively distant from Kuala Lumpur, but both were visited twice a week by a member of the staff who saw every available member of the population and supervised the administration of the prophylactic drug.

Blood-films were examined in the laboratory at Kuala Lumpur and were considered negative when no parasite was seen in fifty fields.

Malaria attacks were recognized as such only where fever was present and asexual parasites were found in the thick blood-films. In most cases the parasites were so numerous as to leave little doubt as to the cause of the fever. Sometimes parasites were present in small numbers and it was thought that these cases might be non-malarial occurring in a parasite carrier. This source of error could not be obviated.

The tea estate (No. 1) is in an isolated tract of hilly country completely surrounded by jungle, much of which is low-lying and swampy. In June, 1935, on account of the intensity of malaria, closure of the estate was suggested as a very costly drainage work was impracticable for economic reasons.

As an alternative it was decided to use the estate for the Commission's inquiry. It fulfilled all the requirements: There were 500 labourers and their dependants closely grouped in lines; there was free breeding of the malaria vector, *Anopheles umbrosus*, within a short distance of the lines and control of malaria against this vector was not possible; the estate was isolated from outside sources of infection by a jungle barrier several miles deep, and active support by the management was assured. Preliminary surveys were made in August, 1935. The trophozoite rate of the population

was fifty per cent and malaria morbidity very high. During September 61 attacks of malaria occurred among 142 individuals of the control group. 477 *A. umbrosus*, of which 31 were found on dissection to be infected, were caught in one mosquito-trap during a period of three weeks at the end of August and beginning of September. *A. umbrosus* was common throughout the period of the experiment and only in February and March did the catches in the trap average less than twenty a night. All the female anopheles caught were dissected and it was evident that intense transmission was taking place at the commencement of the experiment and that a rapid decline in the infection rates occurred thereafter.

The effects of quinine and atebrin prophylaxis may be considered from three points of view: Effects on the incidence of malaria; effects on the parasites; effects on the coolies themselves.

Prophylactic treatment was commenced at the beginning of September, 1935. Atebrin, quinine or an inert control drug was given to comparable population groups, as already detailed. The first effect was the almost abrupt reduction in the number of malaria attacks among the coolies of the atebrin group. The early effects of quinine were less obvious, but there was a rapid decline after the first few weeks of prophylaxis though for some six months the incidence remained a little higher than in the atebrin group.

There was a slower prophylactic response among the children. A monthly attack rate of from 10 to 20 per cent was found among the quininized children for several months, but thereafter there was a rapid decline. The children of the atebrin group reacted more rapidly and after the first few months the malaria incidence dropped to a low level which was maintained throughout the prophylactic period.

The severity and distribution of infection in the three groups was determined throughout the prophylactic year by the number of parasites found in thick blood-films taken on the first day of fever. The cases with parasites less than 1 per thick film and with 1 to 10 parasites per film were far more common in the atebrin group than in the quinine group, where moderate and heavy infections showing 10 to 25 and more than 25 parasites per film occurred for several weeks. The control cases showed a heavy infection with more than twenty-five parasites per thick blood-film for a long period.

The predominant parasite was *P. vivax*, and four out of five attacks were benign tertian. Most of the remaining attacks were subtertian in type.

Prophylactic measures were suspended on August 24 for a period of eight weeks; within a week there was a sharp reappearance of clinical malaria in the individuals of the former quinine group, followed a fortnight later by a similar reappearance in the atebrin group. These cases occurred, although for the last six months of the experimental period there had been a negligible incidence of malaria in both the quinine and the atebrin groups.

During the eight weeks for which prophylaxis was suspended there were 200 attacks, many severe with high parasite counts in the two groups formerly protected—an incidence nearly twice that of the unprotected controls during the same period.

There was little indication that the reappearance of malaria was due to fresh infection. The report stated that the evidence rather suggested that it was due to infections which had been contracted some time previously and had been clinically, and in many cases parasitologically, "hidden" by the prophylactic treatment. The main reasons for believing this to have been the case were: The reappearance of clinical infection was sharply related to the cessation of administration of the drugs; mosquito catches and dissections during, and some months before, the reappearance of infection showed no significant change to account for it; during August, September and October, 1936, only three "first attacks" occurred in the eighty new arrivals who were posted to the controls; six days after stopping the prophylaxis the trophozoite of the quinine group had soared to 38 per cent and 74 per cent in adults and children respectively. During the two months prior to this survey 512 *A. umbrosus* had been dissected and no parasites found.

It was not likely that the infection had been acquired outside the estate as it was completely isolated by jungle swamp several miles deep, peopled by a few nomadic aborigines with whom the estate coolies had no social contact.

An analysis of the malaria histories of sixty-one individuals of the quinine group and seventy-one individuals of the atebrin group made it clear that in many cases the attack developing when prophylactic treatment was withdrawn was the first clinical sign of infection manifest throughout the entire observation period, and, for the reasons given, that these infections had been acquired before the prophylaxis began and had been held in abeyance for periods up to one year, or that they had been contracted during the prophylaxis period and had been held in a state of complete latency. The observers inclined to the latter view as there was both clinical and entomological evidence that infection was occurring irregularly throughout the whole period covered by the observations. The entomological evidence was found in the results of mosquito catches from a single human-bait mosquito trap and indicated how frequently individuals must have been exposed to infection. The clinical evidence lay in the fact that most individuals arriving on the estate for the first time and posted to the controls developed malaria within a few weeks.

The data suggested that the effect of the atebrin twice a week in suppressing or postponing the potential primary attack was more powerful than that of quinine daily.

As regards the effect of prophylaxis on the parasites themselves it was noticed that in the quinine group the trophozoite rate fell from 60 per cent to less than 5 per cent in the period between the first and second surveys

but on the suspension of prophylaxis the rate was higher than in the controls. In the atebrin group the rate fell almost to zero after the first survey, but when treatment was suspended the rate was higher than in the controls. It was noted that among the quinized children, though few clinical attacks were occurring, there was no great difference between the attack rate and the controls, and six days after the cessation of treatment the rate was 70 per cent, twice that of the controls, while on the atebrin group the rate was less than 5 per cent.

Atebrin was associated with a marked reduction in gametocyte carriers and therefore in the sources of mosquito infection. On the cessation of treatment, there was a sharp rise, higher than the controls, of the gametocytes of *P. vivax*.

Throughout the period of the experiment 218 individuals received prophylactic atebrin for varying periods up to one year and ninety-eight received the drug regularly for one year. There was no unequivocal evidence that the atebrin produced any ill-effects, and except for the yellow staining of the eyes there was nothing to indicate which were the atebrin group coolies and which the quinine. There were four deaths in the atebrin group; in two the diagnosis was clear, in the other two it was not possible to come to any definite conclusion as to the cause of death. One of the cases died from acute alcoholism and at the autopsy the liver showed marked fatty degeneration but no cirrhosis. The other case was an anæmic boy who had received atebrin for eight months when it was stopped and he was taken to a native village. There he died and it was found that the liver showed extreme fatty degeneration. These two cases suggest an attitude of caution, and we must accept the possibility (though the evidence at present is inadequate) that in certain individuals atebrin administered over long periods may act as a liver poison.

Two cases developed mental symptoms, but soon recovered. In two other cases dry thickening of the skin of the hands and feet, attributed by the individuals to the atebrin, developed after some months of administration.

Atebrin appeared to have no ill-effects on pregnant women; the number of live births was increased, probably due to the suppression of malaria.

It is known that atebrin may be retained in the body for some time and continued excretion for two months after the last dose has been recorded. But when given in small doses every week for a year it does not appear to be unduly cumulative.

The second plantation, on which experiments on prophylaxis were carried out, was an old rubber plantation situated in hilly country in one of the inland districts of Selangor. It had a resident Tamil population averaging 270. Endemic malaria in varying proportions had been a troublesome problem over a number of years in spite of anti-larva precautions. The malaria incidence was relatively high at the inception of the experiment. The vectors were *A. maculatus* and *A. umbrosus*.

A total of 555 individuals was observed for varying periods up to fourteen months. The population was divided into three groups, and atebrin was commenced on August 26, 1935, and quinine on October 2, 1935.

The malaria incidence, though high at the beginning of that experiment and high again on suspending prophylaxis, was low throughout the entire experimental period, even in the control group. Infections were found only in two *A. maculatus* in August, 1935, and in two *A. umbrosus*, one in November, 1935, and one in May, 1936. There was obviously little malaria transmission during the experiment. Six weeks after the suspension of prophylaxis the management became alarmed at the reappearance of malaria after a year's relative freedom and prophylactic treatment was resumed. Most of the infections occurred in individuals who had received a year's prophylactic treatment. There were no deaths in the atebrin group and no unequivocal evidences of toxicity were observed.

The experiments in both plantations indicate that if the post-prophylactic attacks of malaria are due to infections acquired during, or before, the period of prophylaxis, then the "sterilization" value of both atebrin and quinine is low when the drugs are given in doses and at intervals appropriate for clinical prophylaxis.

SIR ALFRED KEOGH.

IN "Men and Things," by J. A. Spender, there is a chapter dedicated to Sir Alfred Keogh, Director-General of the Army Medical Services during the Great War.

It is a splendid tribute to a man of great vision and administrative genius—one who achieved, successfully without question, the enormous task of saving life and alleviating the sufferings of the British soldiers in the Great War.

No greater epitaph could be given to any man than to quote Mr. Spender's own words: "If a man's services are to be measured by the number of lives he saved, Keogh would easily, I think, head the list for his generation."

Undoubtedly, among the many eminent soldiers of his time, Sir Alfred Keogh was one of the greatest, and it is a sad reflection to realize that his name has not lived in the memory of the nation as have those of the more spectacular and dramatic personalities.

However, by our "Service," which he so ably represented, and by men like the author who, as a confidant, knew and valued the true worth of Keogh, he will never be forgotten.

Clinical and other Notes.

DENTAL EXTRACTIONS IN CHILDREN UNDER VINYL ETHER.

By MAJOR L. S. C. ROCHE, M.C.,
Royal Army Medical Corps.

NITROUS oxide and air anæsthesia is generally unsatisfactory for children, particularly if they require multiple extractions, and therefore the usual procedure is to admit such cases to the Military Families Hospital the day before operation, and to discharge them on the day following operation, after an open general anæsthetic of the chloroform or ether type.

The following are the disadvantages of such a method: (1) The extra risk incurred by the patient under chloroform or under chloroform and ether mixtures; (2) the occupation of a valuable bed for nearly three days; (3) the extra work imposed on the hospital staff; (4) the cost of three days' subsistence in hospital; (5) the disadvantage for the operator to carry out extractions on a prone patient; (6) the necessity of a special visit to the hospital by the operator.

It has been found that all these disadvantages can be eliminated if vinyl ether is used; it can be administered at the Dental Centre in a dental chair, the child being brought as an outpatient and being taken home a short time after operation, in the same way as adult patients under nitrous oxide-air anæsthesia.

Vinyl ether, or divinyl oxide, is a colourless liquid, highly volatile and easily decomposed if exposed to the air. That is why it is best to procure it in three cubic centimetre ampoules. It is obtainable in this country as "Vinesthene" from Messrs. May and Baker, who add 3·5 per cent alcohol and 0·01 per cent phenyl naphthylamine as a preservative. Incidentally it is highly inflammable.

The anæsthetic action is more rapid than that of chloroform. It would appear to be very safe, since overdoses inhibit the respiratory centre only.

There is no tendency to respiratory spasm as with ethyl chloride and elimination through the lungs is as rapid as with nitrous oxide. Though special apparatus has been designed for this form of anæsthesia, it will be found that the ordinary apparatus, "nitrous oxide, with three-gallon bag, I.R. three-way stopcock and facepiece," less the nitrous oxide cylinders and delivery tube, is all that is needed.

The administration is carried out as follows: The stopcock having been set at "Air" the point of a three cubic centimetre ampoule of vinesthene is broken off and the open end of the ampoule is inserted into the rubber tube projecting from the bag. The patient sits in the dental chair and a gamjee pad with a slit for the mouth and nose is applied to the patient's face. The stopcock is set at "no valve" and the facepiece placed on the face in such a way as to catch two expirations or so in order partially to fill the bag. Thereafter the facepiece is kept firmly in position, the patient breathing to and from in the bag. The contents of the ampoule are then shaken into the bag.

In about twenty seconds respiration becomes automatic, the eyes become fixed and after about a minute, when the patient has become slightly flushed, the mask is removed. Relaxation is such that the patient requires no gag and the operator can proceed at once with the extractions. Anæsthesia lasts from forty to sixty seconds after removal of the face-piece. Return to consciousness is extremely rapid, and the patient can walk unaided to the waiting room within one minute.

The action of the vinyl ether is so rapid that its somewhat unpleasant odour is not noticed. It must be, in fact, a pleasant form of anæsthesia, judging by the delighted remarks of one small patient who thought she had been to "fairyländ." Nor do there appear to be any unpleasant sequelæ such as vomiting, dizziness, or faintness.

Though my experience is limited to sixteen administrations with average extractions of four teeth, maximum six teeth, it agrees with the experience of others, who have quoted several hundreds of administrations. I noted neither drawbacks nor difficulties, nor felt any anxiety about any of my cases.

To conclude, the following advantages are claimed for this form of anæsthesia for dental extractions in children: (1) Increased safety; (2) Quicker induction and pleasant recovery; (3) Economy—no need for admission to hospital; (4) Saving of time for the operator and for the hospital staff.

For further details, the reader is referred to the excellent article on the subject by Dr. V. Goldman, in the *British Medical Journal* of July 18, 1936.

I am indebted to Major A. Rhodes and Captain J. A. M. Gemmell, of The Army Dental Corps, for their kind collaboration in this series of cases.

A CASE OF LOCKED TWINS.

MAJOR C. A. WHITFIELD,
Royal Army Medical Corps.

VON BRAUN (Vienna) found that twins became locked once in 90,000 confinements. The following case is therefore reported on account of its rarity.

Mrs. X, aged 26, a primigravida with twin gestation, was admitted to the Military Families Hospital, Gibraltar, on September 3, 1937, suffering from albuminuria in the thirty-third week of her pregnancy. Shortly before 1 a.m. on September 4, 1937, she was awakened by a gush of liquor amnii. Examined an hour later, it was found that a head was loosely engaged on the pelvic brim, the os was the size of a two shilling piece, and the membranes appeared to be unruptured though liquor amnii was draining away. A second head could be felt at the fundus. Labour progressed steadily till noon when there was bulging of the perineum.

At 1 p.m. the Sister reported that progress had not only ceased, but that the head had receded during the previous hour. At 2 p.m. a buttock, not covered by membranes, was seen protruding through the vulva during pains.

The patient was anæsthetized and the pelvis was found to contain: a head with membranes intact (1st twin) and the limbs and trunk of the second twin whose membranes had ruptured. It was found impossible to unlock the twins, the second was therefore decapitated and its body delivered. The first twin was then delivered with forceps after artificial rupture of its membranes, the loose head of the second twin was extracted by hand, and two placentæ and membranes were expressed.

The first twin was living and weighed 4 pounds: the second (decapitated) twin was not weighed but appeared to be slightly smaller than the first. Mother and child did well and were discharged from hospital on the twenty-second day after delivery.

Locking appears to have occurred as follows: The membranes of the second twin ruptured early in labour whilst those of the first twin remained intact. The pelvis was roomy and the twins small. When the os was fully dilated the breech of the second was driven past the head of the first after which locking was inevitable.

My thanks are due to Lieutenant-Colonel M. J. Williamson, M.C., R.A.M.C., Deputy Director of Medical Services, Gibraltar, and Lieutenant-Colonel J. T. Simson, R.A.M.C., Officer Commanding, Military Hospital, Gibraltar, for permission to send this note for publication.

Echoes of the Past.

WAR EXPERIENCES OF A TERRITORIAL MEDICAL OFFICER.

BY MAJOR-GENERAL SIR RICHARD LUCE, K.C.M.G., C.B., M.B., F.R.C.S.

(Continued from page 351).

CHAPTER XXX.—INSPECTION WORK.

The next four weeks were occupied with inspection of the various Lines of Communications Hospitals, at Jerusalem, Gaza, el Arish, and Deir el Belah, and with maturing plans for the new medical arrangements in view of the proposed alterations in the disposition of the troops. It was decided at length that the whole of the 20th Corps should return to Egypt, that the 54th Division of the 21st Corps should follow by sea from Beirut and the 75th Division by rail to Kantara. The Anzac and Australian Mounted Divisions were to be concentrated near Rafa for demobilization. This would leave only the 4th and 5th Cavalry Divisions and the 3rd and 7th Indian Divisions in Palestine and Syria.

In estimating how much medical personnel could be spared for demobilization it was necessary to know if these four divisions and the 75th, which was to be kept intact at Kantara, were to remain at full fighting establishment, which involved keeping the field ambulances at full strength. It was decided that for the moment no reduction would be made, though it was obvious that this would mean the retention of a good many medical officers who were not required for the actual medical care of the troops.

Then came the question of the administration and garrisoning of the occupied enemy's country and the relative responsibilities of the different Allied Governments. This was a thorny problem of international politics, involving old and new agreements with France and recent promises to our Arab allies into which it is not necessary to enter here.

It was decided that for civil administration the conquered country should be divided into three areas, an eastern and two western. Of the western, France was to be responsible for the northern half and England for the southern. The whole of the eastern was to be in the hands of the Arab Government with the King of the Hedjaz at its head.¹

The boundary between East and West in Palestine was the Jordan and to the North of it the valley between the Lebanon and the Anties-Lebanon mountains.

The boundary between the French and English spheres of influence

¹ This arrangement was altered a few years later when France took over Damascus.

was a line drawn West to East from a little North of Acre to the source of the Jordan.

The English area was practically the same as ancient Palestine, extending from Dan to Beersheba, without the portion across the Jordan. This arrangement only involved civil administration. General Allenby, as Generalissimo of the Allied Forces, was still responsible for order in the whole occupied territory as long as it was subject to military law. By the terms of the Armistice there was an area north of the actually conquered country—i.e. north of Aleppo and Tripoli—from which the Turks must withdraw their troops, though retaining the civil administration. In this area the Allies had the right to occupy strategic points and to maintain the control of the railway.

This area included Alexandretta and the province of Cilicia, between the Taurus and the Amanus mountains, and involved the railway and river communication with Baghdad and Mesopotamia. Cilicia and Alexandretta were considered by the French as coming within their sphere of influence, but for the moment it was necessary to garrison this area with British troops as the French had only a very small force in the Eastern Mediterranean and General Allenby was responsible for the carrying out of the terms of the Armistice. Small garrisons, therefore, were sent to Alexandretta, Mersina and even to the North-west of the Taurus mountains to maintain order and to protect the railway. To provide for the medical care of these garrisons it was decided to send part of a casualty clearing station to Alexandretta and another to Mersina. From these posts evacuation would be carried out by means of hospital ships. The organization and disposition of these units took a considerable time and were not completed before the beginning of the next year.

Another problem was the organization of a medical service for the civil administration of Palestine. Colonel Garner, of the Egyptian Medical Service, was appointed A.D.M.S. for the civil administration and a certain number of medical officers had to be spared from the Army to act as his assistants.

At the end of November I paid another visit to Cairo to attend a meeting of Consultants and this time I inspected practically all the hospitals, including several that I had not visited before.

Among them was the hospital at Helouan, a sort of health resort in the desert, ten miles from Cairo. To this hospital was attached a Zander Institute for those requiring special orthopædic treatment, but who were not considered sufficiently bad to send to England or who were awaiting transport.

General Allenby was in Cairo at the time and I accompanied him on a round of inspection to the prisoners-of-war camps and hospitals.

There was at this time a severe epidemic of ophthalmia amongst the Turkish prisoners which was being met by very active measures, both curative and preventive, by our Ophthalmic Consulting Surgeon, Colonel

Eason. Considering the extraordinary prevalence of this disease in Egypt and Palestine we were wonderfully free from it among our own people. It had been a veritable scourge to the army of Napoleon in Egypt at the beginning of the last century and we were very lucky to escape it in epidemic form. A special Committee I had appointed to investigate the causes of a severe outbreak of pellagra among the Turkish prisoners was still hard at work investigating the causes of this disease among the Turks, and I took this opportunity of conferring with them as to their progress, and of learning their views as to the immediate means to be taken to combat the disease. They had come to the conclusion that there was no evidence of it being communicated from one to another, nor had they been able to find any parasite or germ to which its origin could be traced. Everything pointed to it being a disease, like scurvy, of dietetic insufficiency, and their recommendations were an improved scale of rations for the prisoners and a cessation from work for any who showed signs of being affected. Measures were at once put in hand to carry out these recommendations and an improvement gradually began to manifest itself both in the health of those affected and in the number of new cases.

During the second week of December the demobilization of medical officers began. After several alterations of plan it was eventually decided that the selection of individuals for demobilization should be made by the War Office at home, who from this time on cabled out in batches the names of those who had been selected.

This system, while relieving us much of responsibility, involved a good deal of delay and confusion, as the individuals selected were often doing important work in very distant parts of the Command. They could not be released until after their substitutes had relieved them, and the substitutes were often themselves cabled for before they reached their destinations. Unfortunately, too, the system by which the names were selected was often not very fair to those who were left. The selection was made, apparently, largely according to the needs and importunity of the districts from which the officers hailed. As a general rule those were asked for first who had been spared last. Those who had come away voluntarily at the beginning of the War had become less necessary to the community in which they had worked and were often passed over or forgotten. This naturally caused a good deal of heart burning among those who had borne the heat and burden of the day.

On December 17 Cairo was *en fête* to celebrate the cessation of hostilities and to do honour to General Allenby. Many of us went down from Palestine to take part in the festivities. A thanksgiving service was held on the grounds of the Sports Club at Gezireh, at which the Bishop of Jerusalem officiated, followed by Army sports in the afternoon. Next day there was a big "At Home" given by the British residents in Cairo at the Semiramis Hotel, with a banquet to General Allenby and his staff in the evening. On the 19th there was a review of the 10th Division in the

Sports Club grounds. The entertainments continued for another two days, but I had to return to Ramleh before the finish.

On Christmas Eve I went to Jerusalem to be present at the midnight service in the Roman Catholic or Latin part of the Church of the Nativity at Bethlehem. The service lasted over three hours and was conducted with gorgeous ritual. The vestments were beautiful and the whole ceremony most impressive. The weak and disappointing part to me was the music. The endless Gregorian chants were wearisome and though the voices were good the music did not seem worthy of the place and the occasion.

In the course of the service the whole congregation numbering many hundreds marched in procession with candles to the Grotto of the Nativity, which lies in the centre of the old Greek church adjoining the modern Latin one. Though this part of the church belongs to the Greeks, by treaty rights, the Latins and Armenians have access to it at special times and seasons. As we proceeded the wonderful old church, built by St. Helena in the Fourth Century, was all in darkness. According to the calendar the Greek Christmas does not coincide with the Latin and our own, so that they were holding no special celebrations at this time.

The procession illuminated by its candles filed slowly through the darkened church. The clergy and choir passed down the steps into the Grotto, while the rest of us stood in the transept of the church. One candle only broke the darkness of the rest of the church where a solitary Greek monk audibly droned his prayers before an adjoining altar. He completely ignored the neighbouring pageant, endeavouring, it appeared, to obliterate from his mind the existence of any other religious community than his own and to forget the great split that divided the western and eastern church more than twelve hundred years before.

To reach the Grotto the procession had to pass diagonally across the north transept of the old church. This part belongs to the Armenian Church. Some years back a great dispute arose between the Latins and the Armenians about the right of the former to cross the transept. The floor of the transept was covered with a fine carpet and the Armenians insisted that the Latins must pass along the wall round the outside of the carpet. The Latins maintained that it was their right to proceed direct to the Grotto. The matter became international and was referred to the Sultan, who decided in favour of the Latins. Now the corner of the carpet is turned up as far as is necessary for the Latins to proceed straight to their destination without treading on the carpet.

There was a wonderful dispute, too, between the Armenians and the Greeks over the possession of a certain window in the church. Neither side would waive their rights, and in consequence the window remained uncleared for thirty years. During the War, the Turkish General was told the story while being shown over the church and he at once ordered the Turkish soldiers in attendance to clean the window. At the time of our visit it wanted cleaning again.

During the Christmas of 1917, immediately after the Occupation of Jerusalem, there was almost a free fight between the Latin and the Greek monks over some point of precedence in the use of the Grotto. Peace was only restored by the intervention of the troops. After that an armed British guard was always present in the church to maintain order and a sentry stationed in the Grotto itself with fixed bayonet. It would have formed a subject worthy of Bairnsfather to have depicted our friend "Bill" on sentry duty in the solemn twilight of the most sacred spot in the world, to keep order between the rival Christian devotees.

On the following morning we took part in a much more homelike service in the English Cathedral of St. George in Jerusalem. The absence of the jarring note of rivalry and the presence of the familiar words and music were very grateful to war-worn exiles and formed a soothing contrast to the splendour and bathos of the previous night.

CHAPTER XXXI.—MEDICAL EXHIBITION.

The project had been mooted by one of our Consulting Surgeons, Colonel Wade, of holding an exhibition in Cairo to exemplify the special medical aspects of the Egyptian Expeditionary Force Campaign.

A preliminary meeting to consider the proposal was held in Cairo on December 30. It was decided to hold the exhibition early in March, before we were all demobilized. There were to be three sections:—

(1) A photographic section consisting of a collection of photographs gathered from all sources, illustrating all the various aspects of medical work.

(2) A pathological section exemplifying the diseases special to our own campaign such as dysentery, malaria, bilharzia, pellagra, etc.

(3) A sanitary section showing models and diagrams of all the sanitary methods employed in the Force.

It was decided to send the exhibits home to England, after the exhibition, to form part of the proposed permanent Medical War Museum. A committee was formed and the work of organizing was taken up whole-heartedly.

Nazrieh Hospital in Cairo was selected as the most convenient site and Lieutenant-Colonel Rickett, the Commanding Officer, who was a member of the Committee, placed the necessary accommodation at our disposal and the whole of his staff gave most useful assistance.

Photographs and exhibits of the most varied and valuable nature gradually began to pour in. The method adopted as regards photographs was to invite any officer or man who possessed them to send their negatives on loan to Nazrieh. Here they were sorted and sent to the Photographic Department of the Royal Air Force in Cairo who kindly undertook to print them and if necessary enlarge them also. The negatives were then returned to their owners. Most of the models of sanitary appliances and

methods of transport were made in the splint factory attached to No. 21 General Hospital at Alexandria.

From the Ordnance Depot, Alexandria, we managed to collect almost a complete set of the various cacolets and litters employed in the transport of wounded, including a good many captured from the Turks.

Our bacteriologists and pathologists prepared a wonderful collection of exhibits demonstrating the special diseases referred to above.

The Exhibition was opened on March 3 and remained on view for a week. It was visited by large numbers of people both military and civilian. Special leave with railway passes was granted to medical officers who could be spared to attend. In due course the exhibits were packed up for transit to England where they arrived some months later.

Unfortunately the project of a general medical war museum had not materialized in the meantime owing to lack of funds, and the unique collection, unable to find a home of its own, was dissipated among the various museums and was lost to posterity as a historical record of the medical problems of our campaign.

CHAPTER XXXII.—SECOND TOUR OF INSPECTION.

On January 9, I started off once more on a tour of inspection of the Northern Area. This time it was possible to travel to Damascus by train as the bridges over the Yarmuk River near Samakh had been completed a few days before and our own line had reached Haifa.

We were delayed for some hours at Samakh owing to a landslide between there and Deraa, so that we did not arrive at our destination until 5 a.m. on the 10th, instead of 10 p.m. the previous night.

The day was spent in visiting the medical units at Damascus where things had greatly improved since my last visit. The health of the troops was now good and evacuation was proceeding smoothly by Beirut.

At 9 a.m. on the 11th I left by train for Moallaka where there was now a section of the 66th Casualty Clearing Station from Damascus. To pick up the night train on the broad gauge line for Homs I had to go back a few miles to Ryak. The Turks had left no passenger rolling stock on this part of the line so that one had to make the journey in a goods van fitted up with a stove for the use of the Commander-in-Chief a few days before. Homs was now the headquarters of General Chauvel and the Desert Mounted Corps from whom I received hospitality. As no train was going north I spent the next day visiting the town and surrounding country with Colonel Downes, the D.D.M.S.

Passing through Homs on his way south was Sir Mark Sykes, who had come out to act as Commissioner to investigate the condition of the Armenians in the north part of Syria. Having made his inquiry he was now on his way home where he was to die so prematurely within a few weeks.

The problem of this Christian nation scattered widely through a part of their territory has evidently always been a very difficult one for the Turks. Nothing can exonerate them for the heartless way in which they have dealt with it but it is obvious to those who come into relationship with them that the Armenians are a particularly exasperating people, and probably even more so to a people like the Turks than they are to Christians. They seem to be in much the same relationship to the Turks that the Jews were to ourselves in the Middle Ages. Exclusive in religion and taking no part in the national life of the country in which they live they have extraordinary aptitude for business in which they get the better of the Turks at every turn. They are, moreover, extremely prolific and seem to increase and multiply in spite of the very thorough measures the Turks have taken from time to time to exterminate them.

Our own relationship with them was certainly not calculated to increase the sympathy which would naturally go out to a persecuted fellow Christian race. We were compelled to undertake the care of large numbers of Armenian refugees who reached us from various quarters during the course of the War, and at Port Said a large camp was formed for them.

They gave nothing but trouble. They would do nothing for themselves. They were dirty and insanitary, and as far as one could observe anything but grateful for what was done for them. It was much the same in the refugee camps formed in Aleppo after the occupation.

There was a train going north to Aleppo on the morning of the 14th, and Colonel Downes decided to accompany me for the rest of the tour.

The first thirty-six miles of the journey was made in a Ford car fitted with iron-tyred wheels to run on the railway line. We ran along merrily at about thirty miles an hour, dragging a trolley behind us with our baggage and servants. The noise made by the iron wheels on the rails was deafening and made conversation almost impossible. At one stage of the journey the rope connecting us with the trolley snapped, and before we knew what had happened it was left far behind. However, as we were on a downward gradient, by slackening down, the trolley gradually overtook us and was re-attached.

This method of conveyance took us to Hama, where there were two bridges over the Orontes a few miles apart which had not yet been repaired, so that we had to change and proceed through the town for about another four miles in a motor lorry to pick up the train awaiting to take us to Aleppo. This train had proper passenger coaches on it. They were old French rolling stock, and though terribly out of repair, comfortable compared with our previous method of travelling.

At Aleppo we were met by Colonel MacNab, A.D.M.S. of the 5th Cavalry Division, who took us to the Divisional Headquarters of Major-General MacAndrew, commanding the 5th Cavalry Division. This was the Division that had performed the wonderful feat of pursuing an ever-resisting enemy for a distance of three hundred miles, covering that distance in a little over

five weeks. It was a mixed British and Indian Division made up in Palestine, and bearing the traditions of two previously existing divisions. The Indians had come from France in 1918, having served there all the early part of the War. The British were the surviving yeomanry regiments of two of the brigades of our old 2nd Mounted Division, namely, the Gloucester Hussars and the Sherwood Rangers. When General MacAndrew reached Aleppo he knew that there were eight thousand fighting Turks to defend it, but with magnificent coolness and dash he attacked the town with his armoured cars and the one brigade he had available and drove the defenders out. This was the final act of the campaign, and one which brought it to a worthy finish.

Aleppo is an important city even in these days. In olden times it was a great trading centre. The caravans from Persia and Mesopotamia and the East gathered here, and their merchandise was dispatched hence via Alexandretta to Venice and the rest of the Mediterranean. With the discovery of the Cape of Good Hope route its importance gradually diminished, but it is still the meeting place of three highways. From Asia Minor and Europe to the north-west; from Baghdad and Persia to the east, and from Syria and Palestine on the south.

Ten miles out to the north is the junction station of Muslimieh, where the Syria-Palestine railway joins up with the Constantinople-Baghdad railway. This little wayside station may in years to come be one of the important railway junctions of the world. Here, a passenger desiring to travel over land to Egypt or the Cape will change from the great Orient Express running through from Europe to India.

Aleppo is a city of the plain. The old town is centred round a citadel raised on an artificial mound. Its bazaars, typically Eastern, consist of a network of roofed-in narrow streets, each street being devoted to some particular class of industry. At the time of our visit the money market was in a state of the wildest excitement. With the collapse of the Turks no one knew what was to be the future of the paper currency guaranteed by Germany. In the street an English-speaking Syrian produced out of his pocket for our edification a whole handful of gold sovereigns which gave a glitter that had become very unfamiliar to our English eyes. The modern town is quite pretentious with trams and good buildings.

There was quite a lot of medical inspection work to be done in Aleppo. Our chief hospital was run by the 15th Combined Indian Field Ambulance who occupied a school close to Divisional Headquarters. Besides this, officers had been received and made very comfortable in a private hospital belonging to an Armenian doctor in which there were two English nurses who had remained there all through the War. This doctor had a son serving in our own R.A.M.C. There were 354 prisoners of war in an old military hospital known as the Ramadih Hospital. It had been built by Ibrahim Pasha during the occupation of Syria by the Egyptians about 1840. In the Turkish barracks there were more sick prisoners and a large

number of Armenian refugees who, in spite of the hardships they had gone through, looked remarkably fit and well cared for.

The following day, January 16, I drove out in a motor ambulance to Muslimieh, the junction station, which was our extreme frontier post. Here there was part of a cavalry brigade and a section of a field ambulance with a little hospital in the station buildings.

One of the chief problems to be solved at Aleppo was the future route of evacuation. There is a motor road to Alexandretta on the coast, ninety miles away, but the road was getting in a very bad state, and on some days almost impracticable for motor ambulances.

On the other hand, the railway journey to Beirut via Homs, Ryak and Moallaka, involved a break in the journey at Hama until the bridges were repaired and another at Ryak where the gauge changes.

We decided that for the moment the Alexandretta route would still have to be used, in spite of the bad conditions of the road, but it was evident that the railway route should be substituted as soon as trains could get through to Ryak.

The programme of our journey beyond Aleppo had been left open, but as we found that a train was leaving for Mersina on the morning of the 17th we decided to take advantage of it. It was taking Colonel Howell, the new British Controller of Turkish Railways, on a tour of inspection. Under the terms of the Armistice, though the country north of Aleppo remained under Turkish administration, the Allies were to have control of the railway.

The train left Aleppo at 7 a.m. By a curious coincidence the young R.E. officer who was accompanying Colonel Howell to take over charge of part of the line, was a cousin of my own. With the party also was Captain Fielden, R.N., who was travelling north as Armenian Commissioner in succession to Sir Mark Sykes. At the last moment we were asked to find accommodation for a lady on her way back from Aleppo to Adana. She spoke English perfectly and was represented to us as Swiss. It afterwards came to light that the frontier of *her* Switzerland was considerably north of Basle! However, she was very grateful for the help we were able to render and did not give herself away.

The journey was slow. There was no fuel for the engine, but wood. It was curious to see the bridges we passed over guarded by Turkish soldiers.

By noon we reached the foot of the Amanus mountains. This range forms the eastern boundary of the province of Cilicia, just as the Taurus forms its western. It is pierced by a tunnel five miles long. This tunnel had only just been completed when the Armistice came—in fact, both tunnels were to have been opened by the Turks in state on November 7th, just a week after the Armistice was signed.

The engineering of the railway was exceedingly good and evidently the work of Germans. Our engine driver was himself a German, but we felt more comfortable than we should otherwise have done from the fact that

my engineer cousin rode on the engine the whole way. After emerging from the tunnel we had a very long descent into the plain. Parts of it were very steep, and it was even evident that the brakes were none too good. We had some exceedingly uncomfortable moments, and my cousin confessed afterwards that they had only been able to keep control on several occasions by reversing the engine.

There were curious scenes at some of the stations where Turkish soldiers just demobilized and making their way back home on foot, invaded the train to obtain a lift. They were quite orderly and friendly, and as there was no sitting accommodation they were permitted to ride on the top of the carriages. Apparently they all came safely through the tunnels and as far as we knew none were shaken off their somewhat precarious perches.

By dark we reached Adana, the most important town of Cilicia, and lying in about the middle of the plain. Here we stopped the night sleeping in the train.

Next morning we proceeded on our way through Tarsus to Mersina. Five miles from our destination we had to leave the train owing to the destruction of a bridge by a direct hit from one of the ships earlier in the War. The Turks had taken up the rails beyond this point and replaced them by a light Decauville rail. As the Decauville train was not there to meet us we decided to walk on, leaving our servants and baggage to follow.

Mersina is a small open port close to the foot of the Taurus which runs right down to the sea and shuts off Cilicia from the rest of Asia Minor as with a wall. Until the tunnel was made the only means of communication was by a steep and narrow pass known as the Gates of Cilicia.

At Mersina we found a small garrison and a supply base for the troops which had been sent on up through the tunnel to guard the railway. In view of the fact that this might become an important centre if the Turks gave trouble over the terms of the Armistice, we had already arranged to send a casualty clearing station to Mersina. One of the main objects of our visit was to select a site for it.

We were introduced to an American doctor resident in the town who gave us a very gloomy account of the place from a health point of view. It was, he said, like all the flat parts of Cilicia, a hotbed of malaria during the summer and autumn. After a visit to the field ambulance hospital in the town and the proposed immediate site for the casualty clearing station, we drove out with the doctor to prospect for a suitable summer site. A fairly suitable one was found on rising ground about two miles out towards the mountains. Fortunately an old P. & O. steamer called the "Negileh" was sailing the same evening for Alexandretta, so we embarked on her and reached our destination early next morning.

Alexandretta lies on the east shore of the gulf which forms the extreme north-east corner of the Levant. It is close to the Amanus mountains which here run parallel with the coast, and from the eastern boundary of the plain, only a few miles off at the head of the gulf, was the site of the town of Issus, which gave its name to Alexander the Great's second battle with

the Persians. This battle was fought on the banks of the little river Pinarus which runs into the sea between Issus and Alexandretta. After winning the battle of Granicus in Asia Minor, Alexander had been allowed to pass the Cilician gates without opposition, had taken Tarsus and Issus and marched on a few miles beyond the point where Alexandretta now stands. After he had left the Persians marched into Cilicia by a more northerly pass, over the Amanus, and cut him off from his base. He at once retraced his steps and met the Persians lined up on the north bank of the Pinarus, and completely overthrew them.

Alexandretta has a good harbour for small ships and up to a hundred years ago was an important place and one of the chief ports of the British Levant Company. In a small cemetery now much damaged are the graves of some of the leading merchants of that company dating back from the late years of the seventeenth century. There was a branch railway connecting Alexandretta with the main line, but after the fire from one of our destroyers had damaged their trains and permanent way in the earlier part of the War, the Turks took up the last five or six miles of rails. At the time of our visit there were still to be seen the remains of a locomotive on the railside near Alexandretta which had received several direct hits.

The town is built on a marshy plain between the mountains and the sea. The plain is only about half a mile wide and narrows considerably to the north. The mountains are steep and high. At one time in the War, the landing of a British Force at Alexandretta was seriously considered. It would have been no easy piece of work and might have resulted in a second Gallipoli. The chances of making it a surprise were no better than on that occasion. Our warships had frequently been there reconnoitring. Except for the town and harbour, the terrain is not unlike that at Anzac—a narrow foreshore commanded by steep mountains. The only pass over the mountains is that by which the road to Antioch and Aleppo crosses, known as the Beilan Pass. The only means of egress for an army landing would be by this pass or along the narrow foreshore, the route traversed by Alexander. The Turks had already strongly fortified the pass and it could not have been expected that a British landing force would have had the easy task in marching north along the coast that Alexander had against the Persians. Had we been held up on the narrow shore our position would have been worse even than it was at Gallipoli, for Alexandretta is a terribly malarious spot, the marshes being infested with anopheles mosquitoes during the summer and autumn months.

The garrison at Alexandretta consisted chiefly of French troops as the French claimed Alexandretta as part of their sphere of influence and were jealous of our occupying it, but as the port was in the hands of our Navy we had a military commandant. We also had a casualty clearing station there made up from the 31st and 76th, to receive the sick sent down from Aleppo. A great many British captured by the Turks in Mesopotamia and Palestine had been handed over to us here after the

Armistice and shipped hence to Egypt. They had been employed by the Turks in making the railway tunnels.

A few years before the War the Turks had exercised one of their spasmodic fits of energy in an attempt to wipe out malaria at Alexandretta by filling in the marshes. For this purpose they had employed a number of men in digging away the side of a hill and utilizing the soil to raise the level of the foreshore. A very small part of the work was done when funds failed or their energy evaporated. We made a very rough calculation that to complete the work would entail the removal of about two million cubic metres of soil. If this could be done Alexandretta might be made a healthy spot. At present malaria begins in April and continues until June when it begins to slacken. It commences again in a worse form in September and lasts till the cold weather. During the summer and autumn months the inhabitants move out to stations on the mountains. The Germans, who had troops there, had their hospital up in the hills during the War.

In the afternoon, after inspecting the hospitals, we drove about five miles up the Beilan Pass, climbing some nine hundred feet. By the roadside we found several suitable sites for camps or camp hospitals. There were plenty of signs as we went up the pass that the Turks had been fully alive at some period of the War to the possibility of an attempt being made to land at Alexandretta. There were remains of camps on quite a big scale and the hillsides were already trenched in quite a workmanlike manner.

The "Negileh" was sailing the same evening for Tripoli and we went with her, arriving early next morning.

At Tripoli was the headquarters of the 7th (Lahore) Division, with Major-General Sir V. B. Fane in command. The headquarters of the Australian Mounted Division was a few miles off on the Homs Road. I was met at Tripoli by Colonel Sewell, D.D.M.S., of the 21st Corps, who had motored up from Beirut.

The 74th Casualty Clearing Station, formerly at Limber Hill, near Jerusalem, was installed in two capacious buildings, one an American school which contained 400 British and Australians, and the other a French school with 200 Indians. Everything was in excellent order. The reports as to the danger of malaria later in the season were the same here as at Mersina and Alexandretta. Urgent representations were therefore made as to moving the troops and the hospital out to the hills as the spring advanced. Based on Tripoli at the time were 1,800 Egyptian Labour Corps men and 600 camel drivers, who were engaged on road repair and transport work. For their benefit No. 5 Egyptian Hospital had been moved up to Tripoli and was occupying a Franciscan convent in which there were 129 patients.

After a morning spent in inspecting these hospitals we drove out to the Australian Mounted Division Headquarters and spent the afternoon visiting their field ambulances. Two of these were old friends as they had belonged to the Imperial Mounted Division of which I had been A.D.M.S. at the time of the Gaza battles.

Next morning I drove out with General Fane to visit one of his brigades which was just starting to march to Aleppo, taking a field ambulance with it.

At Tripoli Colonel Downes left me to return to Homs by road and Colonel Sewell and I embarked on the hospital ship "Assaye," which arrived opportunely *en route* for Beirut. It gave me the chance of inspecting the ship and at the same time making the journey in comfort.

At Beirut I had time to see all the hospitals and found a very great improvement compared with my previous visit. The "Assaye" completed her embarkation of sick by the afternoon and took me on to Haifa, where I was landed in a shore boat at an early hour next morning.

After visiting Advanced Headquarters, which was now installed at Haifa, and lunching with the Commander-in-Chief, I returned by the evening train to Ramleh. I had been absent for fourteen days and during that time had traversed the whole of Syria and visited practically every medical unit in the forward area.

CHAPTER XXXIII.—FINISHING UP.

On February 16 I paid a long deferred visit to Suez where there was quite a big group of hospitals. Two Indian General Hospitals, an Indian Stationary and a British Stationary, an Egyptian hospital and a prisoners-of-war hospital. Their inspection took nearly two days, but I also had time to pay a visit to the refinery works of the Anglo-Egyptian Oil Company, where the crude oil brought from the shores of the Red Sea is converted by fractional distillation into the three main grades of commercial oil known as petrol, petroleum, and heavy oil.

By this time the arrangements for my own demobilization were beginning to materialize. Early in February I had written to the Director-General asking to be released if possible by the end of March. My letter crossed one from him asking me what I wished to do about demobilization.

On February 13 I went to Haifa to see General Allenby who gave his consent to my making application to be demobilized. On February 28 news was received that Major-General Newland, D.M.S., on the Italian front, had been appointed to succeed me. One more visit was made to Cairo on March 3, to open the War Museum as already described, after which I remained quietly at Ramleh awaiting the time of my release.

General Newland arrived before the end of March, just as the revolutionary difficulties were beginning in Egypt.

After handing over and bidding good-bye to all my friends at G.H.Q., I proceeded to Port Said and embarked for England on the "Leicestershire," of the Bibby Line.

We reached Plymouth on April 7, 1919, almost exactly four years from the date of the sailing of the 2nd Mounted Division. I was demobilized at the port of disembarkation and returned to civil life after more than four and a half years of military service.

Current Literature.

MAY, O. Tuberculosis in Relation to Life Assurance. *Lancet*. 1937, Feb. 27, 493-6, 1 chart.

The annual premiums of life assurance are calculated on certain mortality tables which show how many of the group may be expected to die each year. Most of the tables at present in use are based on groups of people specially selected. The latest table of this type compiled by the Institute of Actuaries is known as "A 1924—29 Ult." and is based on mortalities obtained between these years on persons accepted by various British companies as first class risks. In the cases of tuberculosis, groups of proposers have to be considered in which there is some definite impairment which is likely to upset the mortality curve. From the actuarial point of view the ideal way of assessing this extra risk would be to construct from the experience of a large number of similar cases, the mortality curve, and to calculate from this how best to meet the extra risk thus shown. Unfortunately, for a large proportion of impairments the necessary data are too scanty, and the impairment has to be assessed empirically. The following are the chief plans adopted by insurance companies for accepting impaired lives at special terms:—

"(1) An addition of years to the age at entry, so that the proposer pays an extra premium equal to the difference between that at his actual age and at the rated-up age.

"(2) Similarly, a certain extra sum may be added to the premium either for a limited period or for the duration of the policy, not necessarily corresponding to any special age.

"(3) A reducing debt or lien is imposed, usually a percentage of the sum assured, which lien is reduced each year until it is wiped out. For example, in the case of a policy of £1,000, the lien might be £500, reducible each year by, say, £25, until after twenty years, the lien is extinguished."

The risks may be regarded as increasing, constant, or decreasing, a personal history of pulmonary tuberculosis, underweight, etc., falling in the last group. The author points out that the methods of insurance companies have from necessity at the present stage been grossly empirical and unscientific, but it must be borne in mind that the premiums charged allow only a small margin for medical expenses and that competition between companies is keen, and tends to prevent a too scrupulous investigation of apparently unimportant points. He quotes, too, large actuarial investigations on the influence of family history on tuberculosis, the first by Rusher and Kenchington (1913) and the second by the American Medico-Actuarial Investigation Committee (1914). Both these investiga-

tions confirmed the fact of the adverse influence on mortality of a family history of one or more cases of pulmonary tuberculosis, especially on young underweight proposers. If the proposers are, in addition, tall, the excess mortality is even greater. It must be borne in mind that insurance companies are not specially interested in the causes of the extra deaths in these impaired cases, be they tuberculosis, diabetes, or anything else, but only in the fact of extra deaths in the group in question.

The question of tuberculosis contacts is a hotly debated one. Most insurance companies impose some extra on the policy if the proposer has been living in the same house as a patient suffering from tuberculosis, the amount of the extra depending on the hygienic conditions of the case and the various other obvious factors such as the proposer's physique and family history. In the author's company, it is customary to propose a fairly heavy reducing lien if there has been contact within twelve months of proposal, with an offer to reconsider the terms in a year on medical examination. The author then puts the question as to whether it is practicable to undertake the insurance of proposers with a personal history of pulmonary tuberculosis, and cites two English medico-actuarial investigations of the after-histories of patients who have been under sanatorium treatment as instructive from the point of view of insurance officers. They are those of Midhurst and Frimley sanatoria. "From these it may be assumed that we have a pretty clear view of the mortality of a considerable group of cases having these features: (1) all T.B. positive; (2) all having undergone sanatorium treatment; (3) physical signs as defined above, i.e. limited to infiltration or catarrh of one lobe or small parts of two; (4) without grave complications."

The premiums to cover the risks in these cases would have to be so enormous as to make them fantastic, but if instead of extra premium the method of a decreasing lien is considered, the situation is more promising. Even two years after discharge, cases of this type might be accepted with a very heavy reducing lien, say 80 to 90 per cent, especially if proposing for an endowment assurance.

Recently, the records of the author's company were investigated and entrants for the three years 1921 to 1923 who all had a personal history of tuberculosis (nearly half being pulmonary), and who had been accepted under the conditions outlined above were taken out. They numbered 894, of whom 353 were pulmonary cases. Of the 894, 79 died in the first twelve years of insurance, against an expected 42; of the 353 pulmonary 47 died against an expected 17. This shows that the selection of cases was reasonably good. The actual claims paid in the group amounted to £11,506; the "expected" according to A 1924 to 1929 would have been £11,017—a result indicating that this method strikes a fair balance between the proposers and the company.

Turning to the question of individual selection of patients, the author states that it is seldom practicable to consider artificial pneumothorax

cases on the more favourable terms, for the evidence of a definitely better prognosis is still rather scanty. The same applies to other methods of treatment such as phrenicotomy, thoracoplasty and eleothorax. With regard to genito-urinary tuberculosis, no case would be accepted within five years of the disease except with a maximum lien. A less grave view is taken in the case of tuberculosis of bones and joints and tuberculous adenitis, each case being treated on its merits. A history of primary pleurisy, whether dry or with effusion, is for assurance purposes always regarded as probably of tuberculous origin. It is the author's practice to impose some lien in every case with this history until at least seven years have elapsed, the amount of the lien varying according to different factors and the minimum being 20 per cent. "In our investigation of 2,040 cases accepted in 1921-23, the actual deaths numbered 209, against the 'expected' (A 1924-29) of 159; as regards the amount of claims, the net actual was £37,400 against the 'expected' of £46,475, a fairly substantial surplus, which is largely distributed as bonus to the survivors."

A table is given showing the numerical method of assessment used in America, in which no case is considered until at least a year after the attack.

In conclusion, the author emphasizes the point that the life assurance attitude towards tuberculosis is inevitably one of grouping cases into classes for which some sort of mortality table has been calculated or can be presumed, rather than of considering them as clinical individuals. Such an attitude must inevitably lead to harshness in some cases and leniency in others, but there seems to be no way of avoiding this state of affairs at present.

S. ROODHOUSE GLOYNE.

Reprinted from "Bulletin of Hygiene," Vol. 12, No. 7.

CHAPMAN, G. H., LIEB, C. W., BERENS, C. & CURCIO, Lillian. **The Isolation of Probable Pathogenic Staphylococci.** *J. Bacteriology.* 1937, v. 33, 533-43.

The object of this work was to devise a means of simplifying the search for pathogenic staphylococci in morbid material, since the picking of colonies and testing of their pathogenicity by animal inoculation may be difficult and unreliable. The medium ultimately used consisted of beef extract agar containing 1 per cent lactose, 0.5 per cent proteose peptone and 0.017 per cent bromthymol blue, so adjusted that the pH was 8.6 after sterilization. Staphylococcal colonies are morphologically similar to those on ordinary agar, and are usually of a deep yellow colour, but occasionally grey with a blue tinge. Other bacteria, such as the coli-aerogenes group, grow well but the colonies are easily recognizable.

Tests were carried out on a large number of strains and it was shown that on this medium non-pathogenic staphylococci were inhibited, and that there was high correlation between growth and pathogenicity as tested by

animal inoculation and other *in vitro* tests. Power to hæmolyse rabbit cells, production of plasma-coagulase and typical growth on crystal-violet agar [*Bulletin of Hygiene*, 1935, v. 10, 126, 600] had been shown to be reliable tests of probable pathogenicity.

Examination of 276 strains gave 7·7 per cent of erroneous results, but 6·2 per cent of these were due to growth of strains shown by other *in vitro* tests to be negative, only 0·5 per cent being due to failure of *in vitro* positive strains to grow, so that the latter figure would be the approximate error of the method if confirmed by one of the other tests mentioned.

J. C. CRUICKSHANK.

Reprinted from "Bulletin of Hygiene," Vol. 12, No. 9.

MEADER, F. M. **Prophylaxis of Whooping-Cough.** *Amer. J. Dis. Children.* 1937, v. 53, 760-67.

This paper records the results obtained in whooping-cough prophylaxis by the injection of serum from patients recovered from the disease. A dosage of ten cubic centimetres was given subcutaneously to 115 exposed susceptibles from 1 to 6 years of age, and whooping-cough developed in 37. The disease developed, however, in 8 patients the first day after serum was given, and in another 13 during the first six days after injection. Only 16 cases are therefore charged against the serum as failures. From what happened in an observed group of 183 controls of the same age and in the same conditions of exposure, it is calculated that without serum 57 children would have contracted whooping-cough as against the 16 mentioned, a protection rate of 72 per cent. Owing to the long incubation period the author concludes that while the results will probably never be so spectacular as similar convalescent serum is in scarlet fever with its short incubation period, nevertheless when three-quarters of exposed susceptibles are protected, if serum is given in the first six days of exposure, the reward is considerable. The most favourable results are obtained in the first three years of life.

A. JOE.

Reprinted from "Bulletin of Hygiene," Vol. 12, No. 9.



Reviews.

A TEXTBOOK OF THE PRACTICE OF MEDICINE, INCLUDING SECTIONS ON DISEASES OF THE SKIN AND PSYCHOLOGICAL MEDICINE. Fifth Edition. By various authors. Edited by F. W. Price, M.D., C.M., F.R.C.P., F.R.S.Edin. London : Humphrey Milford, Oxford University Press. 1937. Pp. 2038. Price 36s ; India paper, 45s.

Few new editions of standard textbooks of medicine will arouse so much interest as that of the "Textbook of the Practice of Medicine," edited by F. W. Price. In the present, fifth, edition the editor's preface readily shows the magnitude of the changes incurred in its preparation by the loss of previous contributors, the introduction of others to carry on the work and the necessity for redrafting pre-existing material and incorporating new matter. He and his collaborators are to be congratulated on bringing the subject matter thoroughly up to date without adding to its bulk.

Advances in pathology, diagnostic methods, and treatment, which have taken place in recent years are adequately represented in the extensive redrafting of many articles, and with many additional descriptions of conditions now recognized as clinical entities little is found wanting in this comprehensive survey of medicine. Prominence is given throughout to matters of diagnosis, prognosis and treatment. In a work to which a number of collaborators contribute some variation in degree of detailed presentation is inevitable. For example, the diagnosis of spirochætosis ictero-hæmorrhagica is discussed without reference to serological methods, and perhaps rather inadequately on this account, whereas in the diagnosis of hydatid cyst a detailed reference to serological methods is made. Those whose work brings them in contact with tropical diseases will be interested to note that the previous high standard of the sections dealing with tropical medicine has been enhanced by additions and alterations which enable the volume to meet all the normal requirements of a work of reference, particularly with regard to treatment. Special commendation, however, cannot be given to any one section of the work, as a similarly high standard is found in them all.

The student who turns to the Section on 'Diseases of the Kidney,' may be somewhat confused to find the term 'chronic interstitial nephritis' relegated to the primarily vascular group. The reasons for this, however, are clearly stated in the text, which contains an account of malignant arterio-sclerosis, a subject which has hitherto tended to escape representation in textbooks by British authors.

The Section on Psychological Medicine has been entirely re-written, and is prefaced by an excellent general account of the psycho-pathology, course, prognosis and treatment of mental disorders. It would be difficult

to find a better introduction to a study of mental disorders than the matter therein presented.

The work deserves the highest praise, and the new edition consolidates its position as a monumental book of reference. An excellent index of 153 pages meets all the requirements of ready consultation. The special edition printed on India paper of smaller size will make a strong appeal to the systematic reader and to the purchaser whose requirements include a lesser bulk than that presented by the book in its original form.

J. B.

THE ARCHITECTS' JOURNAL. Vol. lxxxv, No. 2214, June 24, 1937. The Architectural Press, 9, Queen Anne's Gate, S.W.1. Price 1s.

This number is entirely devoted to the subject of hospitals, and reviews the progress in the subject of hospital planning during the last five years—the last special "Hospitals" number having been issued in November, 1932. This beautifully illustrated issue provides a valuable summary of present-day views on hospital structure and design both at home and abroad, and the leading articles treat the subject from the medical and architectural aspects.

The principal change which is taking place in hospital design is the adoption of the centralized, many-storied block building planned vertically, in place of the pavilion type of hospital with its long, widely separated horizontal blocks. Accompanying this change, and no doubt partly because of it, there is a strong tendency towards a reduction in the size of wards. This tendency is shown markedly in continental design.

Another innovation, of which we learn in the section devoted to planning, is that of the increasing use of the "parallel bed" or "verandah" type of ward unit. In this the beds are placed parallel to the longer walls of the ward, and this allows the use of wide windows on the south wall of the ward. In such wards glass partitions may be placed between groups of two or four beds thus sub-dividing the ward into cubicles and, at the same time, assisting in preventing the spread of ward infections.

It is a disappointment to learn that the prevention of noise in modern hospital construction is a problem which is not yet solved, and the increasing use of steel frame construction serves to intensify this problem. Door silencers, rubber flooring in wards and corridors, and the use of coloured lights in place of bells for summoning attendants may all be used to assist in keeping down irritating noises from within the building.

Hospital construction is a subject with which officers of the Royal Army Medical Corps are often intimately associated, both as regards new construction and the alteration of existing buildings, and this hospital number of the *Architects' Journal* should find a place in hospital libraries and in the personal libraries of all those interested and concerned in the planning and administration of hospitals.

W. J. F. C.

Correspondence.

APPENDICITIS.

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—Major K. Fletcher-Barratt's reply to my criticism of his article on "Appendicitis" tempts me to enlarge on the early diagnosis of the disease. But I will resist the temptation and try to confine myself to a few comments on his letter.

I am glad to see that he agrees that immediate operation is indicated in definite cases of early appendicitis. That reduces the point of difference to one of diagnosis.

I have re-read his article, as he suggested, and have been struck by the excellent picture that he draws of a typical attack of appendicitis in the early stage. Only a few weeks ago I removed an appendix, distended with pus and about to perforate, from a case with just such symptoms; and I have records of many more. The signs may not be those of the textbooks, but by the time these develop infection has at least involved the peritoneal coat of the appendix: in other words there is peritonitis—local no doubt, but liable to lead to those post-operative complications which he rightly holds in respect.

I am glad to learn that he has had no fatalities among the cases in which medical treatment has been unsuccessful (his category D). But the fact that he attributes his success to "watching the cases himself and not relying upon the observations of others," suggests that he is alive to the risk.

The Ochsner-Sherren method was devised to avoid the risks of operation in complicated cases. It was not intended to replace the safe operation for removal of an appendix in the early stages of inflammation or obstruction.

Millbank.

October 19, 1937.

I am, etc.,

C. M. FINNY,

Col. R.A.M.C.

Notices.

THE LOVIBOND COMPARATOR.

THE Lovibond Comparator, manufactured by The Tintometer Ltd., of Milford, Salisbury, Wilts., consists of a small bakelite case roughly 4 by 4 by $1\frac{1}{2}$ inches with two viewing holes for comparing colours. The coloured solution is placed in a cell behind one hole and a suitable disc holding nine differently tinted glass circles fits into the case so that one of the glass circles is behind the other hole. On turning the disc, the tints in the two holes can be matched and the value read off on an indicator.

The apparatus can be used for determining pH values colorimetrically, free chlorine in water, blood sugar, bilirubin in serum, icterus index, protein in urine, etc., and for other chemical clinical determinations.

The comparator itself costs £3 10s., and suitably tinted discs for each determination about £1 10s. each. It is cheaper than a colorimeter and takes up less space. No calculations are necessary as the answer is registered on the disc indicator. The tinted glasses made by this firm do not lose their colour in tropical climates and the bakelite case should not warp. Experience with the apparatus for the determination of pH values for bacteriological media has shown it to be very efficient.

ANTISTREPTOCOCCAL THERAPY.

EIGHTEEN months ago Messrs. May and Baker, Ltd., introduced to the medical profession the first colourless antistreptococcal drug for oral administration—Proseptasine, the benzyl derivative of sulphanilamide. Since that date compounds of this type have come into widespread use and have largely replaced the azo-dyes hitherto employed.

A colourless substance suitable for injection was not available until February of this year when the firm presented the first colourless soluble drug designed for intravenous and intramuscular injection—Soluseptasine. Clinical experience indicates the value of Proseptasine and Soluseptasine over a wide field of streptococcal infections, extending to many types of cases.

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